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RP 14-1997
Revision of RP 14-1988

SMPTE RECOMMENDED PRACTICE

Plotting Data from Sensitometric Strips Exposed on Type Ib (Intensity Scale) Sensitometers

1 Scope

The purpose of this practice is to specify the relationship of the spacings of the exposure scale (horizontal coordinate) of graph paper on which sensitometric data are plotted and the corresponding increments of the logarithm of exposure in the sensitometer when the exposure modulator is a step tablet.

2 Normative references

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

ANSI/ISO 5-2-1995, ANSI/NAPM IT2.19-1995, Photography — Density Measurements — Part 2: Geometric Conditions for Transmission Density

ANSI/ISO 5-3-1995, ANSI/NAPM IT2.18-1996, Photography — Density Measurements — Part 3: Spectral Conditions

3 Exposure method

3.1 In a type Ib (intensity scale) sensitometer, the most common method of modulating the illumination falling upon the sample employs a step tablet. The exposure is made with the emulsion of the sample in contact with the modulator except for a thin, transparent acetate cover which protects the modulator against abrasion and foreign matter. The opening and closing of a shutter admits light for the required period of time. Step tablets may be cast with gelatin containing dyes or colloidal carbon or, alternatively, may be produced photographically by suitable exposure and development of film or plates.

3.2 With a step tablet as the exposure modulator, the illumination reaching the sample is dependent upon thetransmittance of the various steps of the modulator. This assumes uniformity of illumination. Density, being the common logarithm of the reciprocal of the transmittance, is a more convenient method for specifying the light-stopping power of the segments of the modulator. Density may be measured with a densitometer calibrated in reference to ANSI/ISO 5-2, ANSI/NAPM IT2.19, and ANSI/ISO 5-3, ANSI/NAPM IT2.18.

3.3 The Ib (intensity scale) sensitometer exposure modulator should typically have step-to-step increments of 0.15 diffuse transmission visual density; however, other increments can be used for specific needs. As modulators vary somewhat from this 0.15 increment, it may be necessary to adjust the step reference points on the exposure axis (horizontal coordinate) of the sensitometric graph paper to represent the actual densities of each step in the tablet. (Single step departures of the order of 0.015, or less, from the ideal 0.15 density increment, when known, would not be considered significant. However, cumulative errors, especially those which occur in the same direction, are significant and can lead to erroneous results (see figure 1).

4 Method of correction

4.1 The steps of the exposure modulator shall be measured with a densitometer reading in diffuse transmission visual density, specified in

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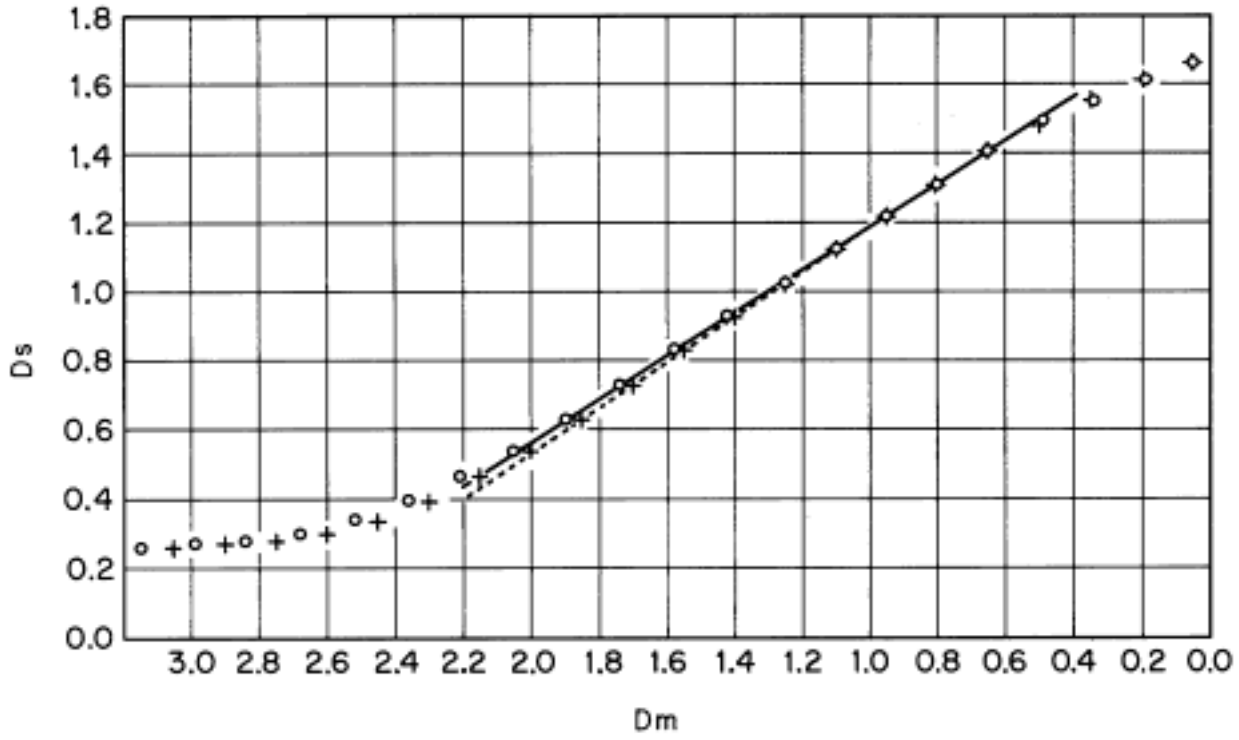

NOTES

1 - - -x- - -x = curve showing sample densities versus modulator densities assumed to have consecutive ideal increments of 0.15.

2 —o—o— = curve showing same sample densities versus actual modulator densities for a modulator not meeting the criterion of 4.3 2).

Figure 1 – Sample densities versus modulator densities

ANSI/ISO 5-2, ANSI/NAPM IT2.19 and ANSI/ISO 5-3, ANSI/NAPM IT2.18. Such densities are normally shown on the calibration chart accompanying each new step tablet.

4.2 If such a calibration chart is not available, the step tablet should be removed carefully from the sensitometer and from its removable protective cover, if any, and each step read on a densitometer (see 4.1).

4.3 Unless the step tablet modulator conforms to the following specifications, the sensitometric density data shall be plotted against the actual rather than the nominal densities of the step tablet:

1) The density increment between any two adjacent steps shall be 0.150 ± 0.015 density.

2) The departure of any step from its nominal density value shall not exceed 0.02 density or 2% of its density value, whichever is greater. The nominal value is defined as the density of the lowest density step plus 0.15 times the number of steps above the lowest density step.

3) No individual step shall depart from the best linear fit through all the steps by more than a density of 0.02.

5 Method for plotting actual densities of the step-tablet modulator

5.1 For laboratories using graph paper where the scale of the horizontal coordinate is as long or longer than the scale of the vertical coordinate: most laboratories carry a supply of printed graph sheets for the plotting of sensitometric data. These sheets normally carry a density scale on the vertical coordinate and a numbered "step" scale or log exposure reference on the horizontal coordinate. It is suggested that the density scale be cut off a graph sheet and placed along the horizontal coordinate of a second sheet. The scale of the first sheet should be oriented as shown in figure 1.

5.2 The density readings of the exposed and processed sample may now be plotted against the actual step-tablet densities.

5.3 For laboratories using graph paper where the horizontal coordinate is shorter than the vertical coordinate: on graph sheets where the horizontal coordinate carries 7½ equal divisions between each "step" or log exposure reference, each division represents 0.02 density of the sensitometer step tablet and may be used as reference to plot the densities of the step tablet against the densities of the exposed and processed sample.

5.4 Where there is no scale on the horizontal coordinate between each "step" or log exposure reference, a scale may be drawn to divide the space between each reference into 7½ equal parts. Each part will represent 0.02 density of the sensitometer step tablet. This scale may be moved up the sheet opposite the various density readings of the exposed and processed sample so as to locate the step tablet densities versus the processed sample densities.

6 Care of the modulator

6.1 Step tablets are very delicate. To prevent damage, it is customary to protect the tablet with a thin, transparent acetate cover. The surface of the cover should be inspected from time to timeto ensure that it is clean and free from abrasion. The acetate cover should be renewed when necessary to ensure that the diffuse transmission densities of the modulator steps are not affected by dirt or abrasion on the cover.

6.2 Although the density of step tablets normally changes little over periods ranging up to two years, it is suggested that the tablets be checked for density from time to time.

Annex A (informative)
Bibliography

Jones, Loyd A. Photographic sensitometry, Part I, Jour. SMPE 17:491-535, October 1931; Part II, Jour. SMPE 17:695-742, November 1931; Part III, Jour. SMPE 18:54-89, January 1932; Part IV, Jour. SMPE 18:324-355, March 1932.