

KODAK Panchromatic Sound Recording Film 2374 (ESTAR)

1) Description

KODAK Panchromatic Sound Recording Film 2374 is a high contrast, panchromatic black-and-white film designed for recording variable-area sound track negatives with a tungsten light source, and/or producing digital sound track negatives. Analog negatives made from this film produces an excellent silver-, high magenta-, and cyan only- soundtracks. It is optimized to produce all three types of digital soundtracks negatives: DTS (Digital Theater Systems), DOLBY Digital, and SONY SDDS (SONY Dynamic Digital Sound).

This film gives excellent results when exposed and processed to print sound tracks on any of the following films:

KODAK VISION Color Print Film / 2383.

KODAK VISION Premier Color Print Film / 2393.

KODAK VISION Color Teleprint Film / 2395 (35 mm) and 3395 (16 mm).

KODAK Black-and-White Print Film / SO-302.

EASTMAN Fine Grain Release Positive Film 5302 (35 mm) and 7302 (16 mm).

Features	Benefits
<ul style="list-style-type: none"> • A process-surviving anti-static support. 	<ul style="list-style-type: none"> • An increase in the number of clean, high-quality prints, meaning increased productivity for labs. • Longer running digital sound track before defaulting to analog due to dirt and dust buildup for theatres.
<ul style="list-style-type: none"> • Increased sharpness. 	<ul style="list-style-type: none"> • Increased analog negative latitude enabling easier cross-modulation cancellation. • Improved signal-to-noise ratio (SNR). • Improved high frequency response. • Improved bit clarity in digital tracks, giving greater DOLBY DQI and SONY SDDS-QC values. • Improved sound quality in both analog and digital tracks. • Longer lasting digital tracks on release prints.
<ul style="list-style-type: none"> • Increased time of development (TOD) sensitivity. 	<ul style="list-style-type: none"> • Sound transfer houses and laboratories have more degrees of freedom in processing the sound negative and achieving the required cancellation density to yield excellent analog performance.^[1]
<ul style="list-style-type: none"> • Incorporation of scratch-resistant T-coat. 	<ul style="list-style-type: none"> • Increased productivity in laboratory high-speed printing operations due to reduced propensity for negatives to scratch.
<ul style="list-style-type: none"> • Increase green speed. 	<ul style="list-style-type: none"> • Increased DOLBY Digital DQI performance. • A larger negative density/print density operating window over which excellent DQI performance is attainable.
<ul style="list-style-type: none"> • Reduced white light speed. 	<ul style="list-style-type: none"> • Enables analog exposures that are better positioned in the operating range of the light source.
<ul style="list-style-type: none"> • Increased halation protection and light management. 	<ul style="list-style-type: none"> • Better frequency response and signal-to-noise performance.
<ul style="list-style-type: none"> • Gray ESTAR support. 	<ul style="list-style-type: none"> • Same printer setup as current 2374 and 2378 sound negatives. • Less chance of printer setup errors when changing from one negative type to another.

^[1]This feature is evident in the KODAK D-97 Process, but the magnitude of this benefit can vary as the photo-processing chemistry deviates from D-97.

2) Base

KODAK Panchromatic Sound Recording Film 2374 is coated on a 4.7 mil gray ESTAR safety base with a process-surviving anti-static layer.

3) Darkroom Recommendations

Do not use a safelight. Handle unprocessed film in total darkness.

4) Storage

Store unexposed film at 13°C (55°F) or lower. For extended storage, store at -18°C (0°F) or lower. Process exposed film promptly.

Store processed film according to the recommendations in ISO 18911:2010, *Imaging Materials - Processed Safety Photographic Films - Storage Practices*. For medium-term storage (minimum of ten years), store at 25°C (77°F) or lower, preferably below 21°C (70°F), at a relative humidity not exceeding 60 percent; for extended-term storage (for preservation of material having permanent value), store at 21°C (70°F) or lower at a relative humidity of 20 to 50 percent. For active use, store at 25°C (77°F) or lower, at a relative humidity of 50 +/- 5 percent. This relates to optimized film handling rather than preservation; static, dust-attraction and curl-related problems are generally minimized at the higher relative humidity. After usage, the film should be returned to the appropriate medium- or extended-term storage conditions as soon as possible

5) Exposure

Analog Sound Negatives:

This film should be exposed to tungsten illumination to produce a sound-track visual negative density (including base density) between 2.8 and 4.2³ which provides cross-modulation cancellation when printed to achieve the required print density. The optimum print density is that which provides the best combination of signal-to-noise ratio (SNR) and high-frequency response. These measurements should be performed for silver-, high-magenta-, and cyan dye tracks, as required, and confirmed by listening tests.⁴

Digital Sound Negatives:

As with analog tracks, the optimum negative density is determined by recording a series of densities, and then printing them. The best quality is then determined through playback on the Quality Control system being used in each instance.

The visual negative densities **recommended by the manufacturers of digital sound equipment** are as follows:

Digital Sound Track	Visual Track Density
Digital Theater Systems (DTS)	equal to the analog track density
DOLBY Digital (SR*D)	1.30 +/- 0.10 ^[1]
SONY Dynamic Digital Sound (SDDS)	2.00 +/- 0.10

^[1]Optimum negative density should be adjusted to each individual system by using an optimization test. The Kodak tests show that a higher negative density yields better performance in print as measured by DQI (the DOLBY Quality Index).

For further assistance with optimum negative track and print densities, please contact your Kodak representative.

6) Processing

The following process recommendations should be used as starting points for a typical continuous-immersion processing machine using formulas presented in KODAK Publication No.H-24.15, *Manual for Processing KODAK Motion Picture Films, Module 15*. The processing times may require modification for a particular machine.

³Exposures other than white light will yield a lower analog negative density value.

⁴J. O. Baker and D. H. Robinson, "Modulated High-Frequency Recording As a Means of Determining Conditions for Optimal Processing." *Journal of the SMPE*, 30:3-17, January 1938, or SMPTE Recommended Practice RP104-1994, "Cross Modulation Tests for Variable-Area Photographic Sound Tracks," obtainable from SMPTE, 595 W. Hartsdale Avenue, White Plains, NY 10607-1824, tel (914) 761-110, web site URL: <http://www.smpete.org>.

Notice: Observe precautionary information on product labels and on the Material Safety Data Sheets.

Processing Step	Temperature	Time	Replenishment Rate (mL per 100 ft)	
			35 mm	16 mm
KODAK Developer D-97 ^{[1][2]}	23.9 +0.3°C (75 +-1/2°F)	4 min ^[3]	650 (D-97RS)	325 (D-97RS)
Stop Rinse ^[4]	24 +-1°C (75 +-2°F)	50 sec	12,000	6,000
KODAK Fixing Bath F-5 ^[1]	24 +-1°C (75 +-2°F)	9 min	600	300
Wash (counter-current)	24 +-1°C (75 +-2°F)	10 min	12,000	6,000
Dry	35°C (95°F)	— ^[5]		

^[1]Provide agitation in the developer and fixing bath by recirculation through submerged spray jets that impinge on the film strands.

^[2]An ascorbic acid developer is an acceptable alternative to HQ.

^[3]Do not overdevelop this film to the point where it greatly increases fog level. This will cause a reduction in sound quality.

^[4]Use a countercurrent flow of fixer-laden water overflow from the wash tank, pH about 6.

^[5]Drying depends on many factors such as air temperature, relative humidity, volume and rate of air flow, flow distribution pattern, squeegee set-up, etc. In a typical motion picture film drying cabinet with air at about 35°C (95°F) and 40 to 50 percent RH, satisfactory drying will require 15 to 20 minutes. Film leaving the drying cabinet when it has reached room temperature should be in equilibrium with room air at approximately 50 percent RH.

7) Identification

After processing, the words 'KODAK Safety Film', the strip number, and year symbol are located in the center, along the length of the film.

8) Image Structure

The modulation-transfer and the diffuse rms granularity data were generated from samples of 2374 Film exposed with tungsten light and processed as recommended in KODAK Developer D-97 at 24°C (75°F). For more information on image-structure characteristics, see KODAK Publication No. H-1, *KODAK Motion Picture Film*.

rms Granularity⁵
 Refer to curve.

9) Available Roll Lengths

For information on film roll lengths, check Kodak's Motion Picture Films for Professional Use price catalog or see a Kodak sales representative in your country.

⁵Read at a net diffuse visual density of 1.0 using a 48-micrometer aperture.

10) Graphs⁶

Characteristic

- A) Exposed at 580nm for 100 microseconds (4-01)
- B) Exposed at 660nm for 100 microseconds (4-01)
- C) Exposed using Tungsten (2850K) plus KODAK Heat Absorbing Glass, No.2043,1/1000 sec. (4-01)

MTF

- D) (3-01)

Note: These photographic modulation-transfer values were determined by using a method similar to the one described in ANSI Standard PH2.39-1977(R1990). The film was exposed with the specified illuminant to spatially varying sinusoidal test patterns having an aerial image modulation of a nominal 35 percent at the image plane, with processing as indicated. In most cases, the photographic modulation-transfer values are influenced by development-adjacency effects and are not equivalent to the true optical modulation-transfer curve of the emulsion layer in the particular photographic product.

rms Granularity

- E) (3-01)

Note: To find the rms Granularity for a given density, find the density on the left vertical scale and follow horizontally to the characteristic curve and then go vertically (up or down) to the granularity curve. At that point, follow horizontally to the Granularity Sigma D scale on the right. Read the number and multiply by 1000 for the rms value.

Spectral Sensitivity

- F) (3-01)

Time of Development (TOD) in D-97 at 75°F

- G) (3-01)

Note: The Kodak materials described in this publication for use with KODAK Panchromatic Sound Recording Film 2374 are available from dealers who supply Kodak products. You can use other materials, but you may not obtain similar results.

The contents of this publication are subject to change without notice.

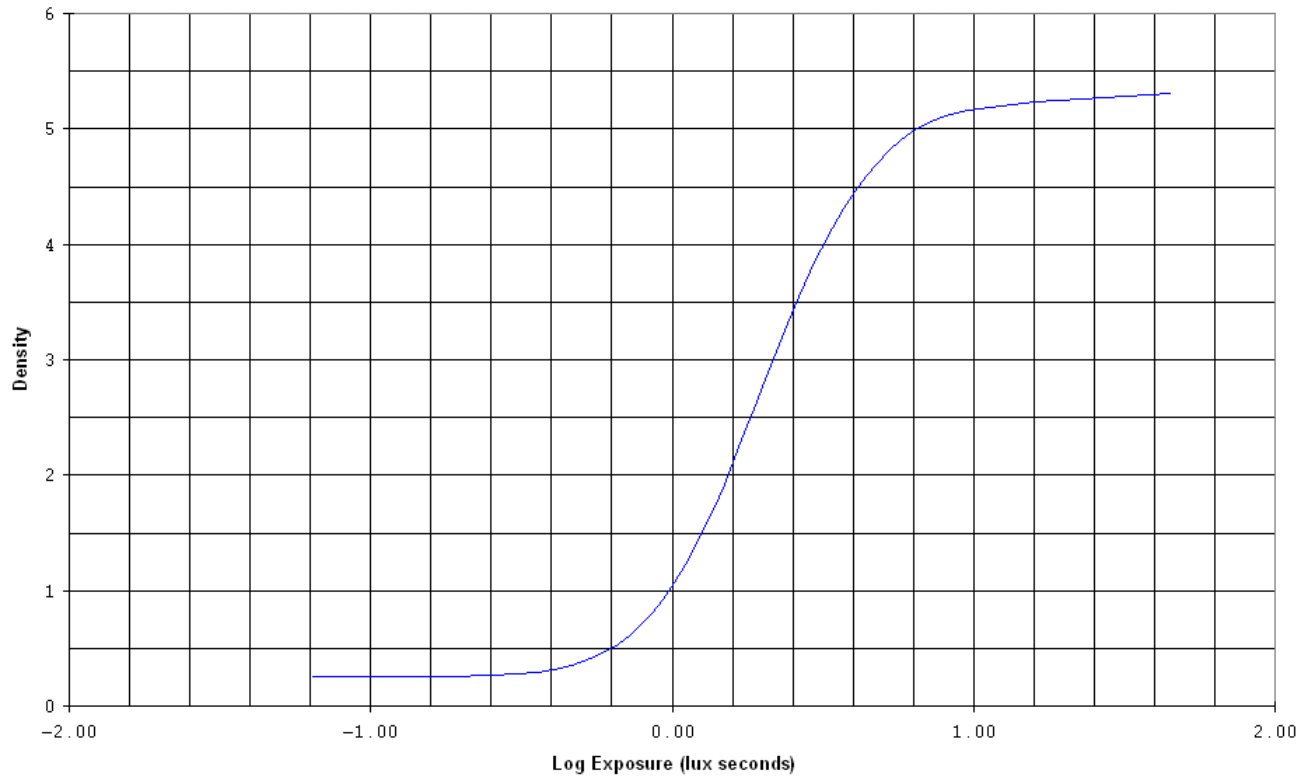
Kodak, Eastman, Vision, 2374, 2383, 2393, 2395, 3395, 5302, 7302, and Estar are trademarks.

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EASTMAN KODAK COMPANY - Rochester, NY 14650

End of Data Sheet

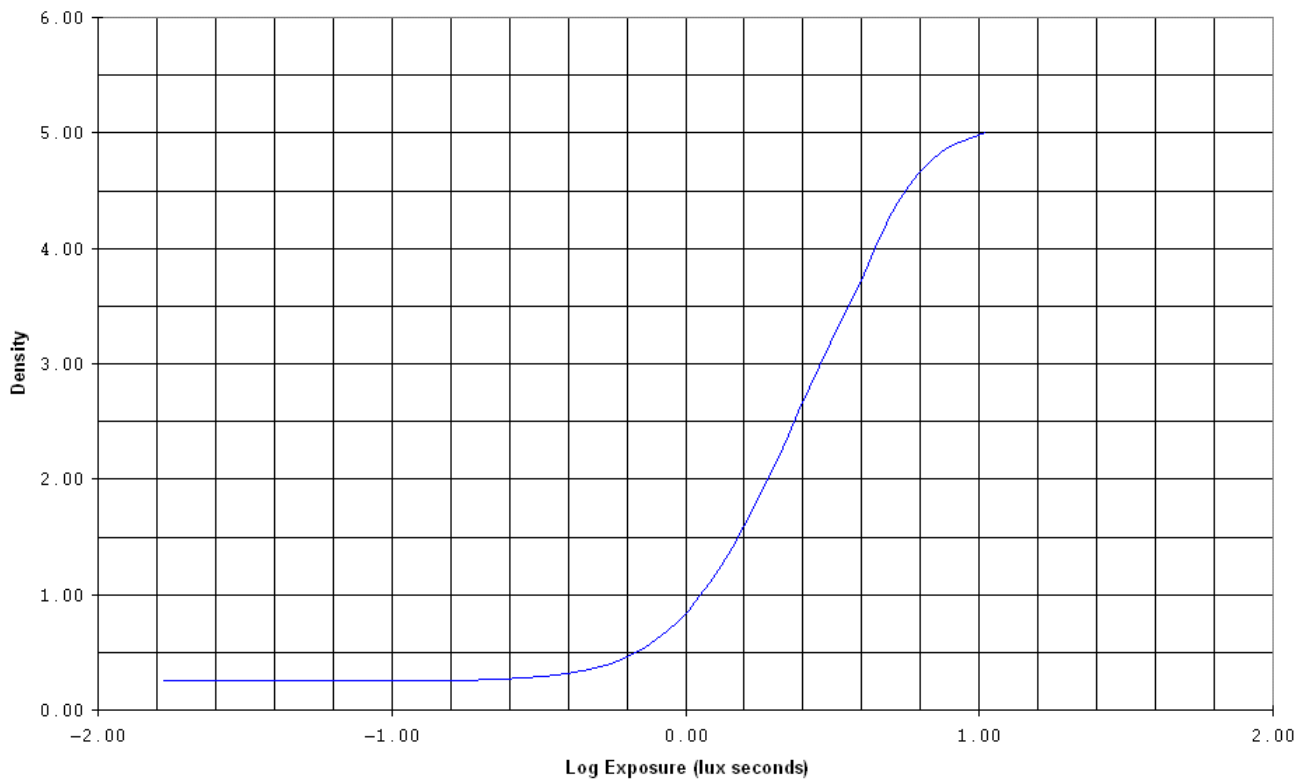
⁶NOTICE: The data in this publication represent product tested under the conditions of exposure and processing specified. They are representative of production coatings, and therefore do not apply to a particular box or roll of photographic material. They do not represent standards or specifications that must be met by Eastman Kodak Company. The company reserves the right to change and improve product characteristics at any time.

TI2292A 4-01
CHARACTERISTIC, For Publication
KODAK Panchromatic Sound Recording Film 2374
580nm at 100 microseconds; KODAK Developer D-97, 4 min, 75F (24C);
Diffuse visual



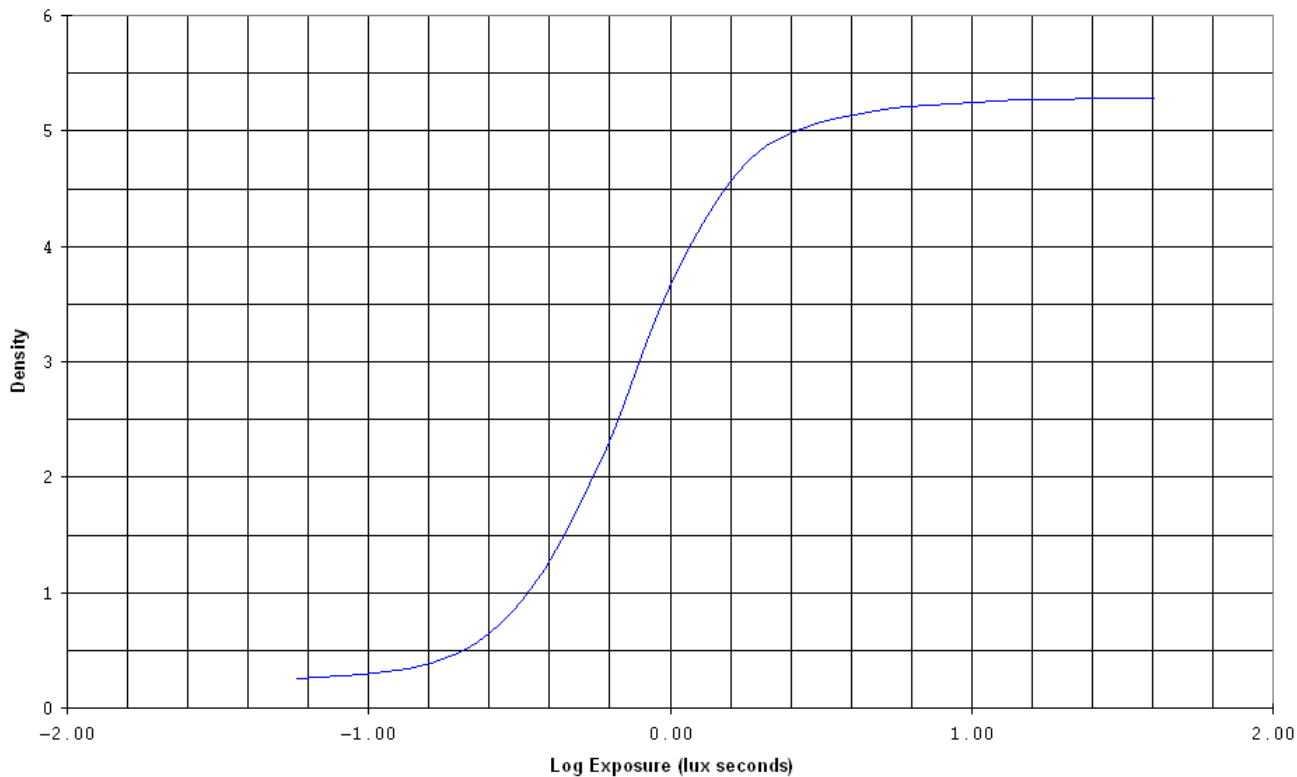
Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI2292B 4-01
CHARACTERISTIC, For Publication
KODAK Panchromatic Sound Recording Film 2374
660nm at 100 microseconds; KODAK Developer D-97, 4 min, 75F (24C);
Diffuse visual



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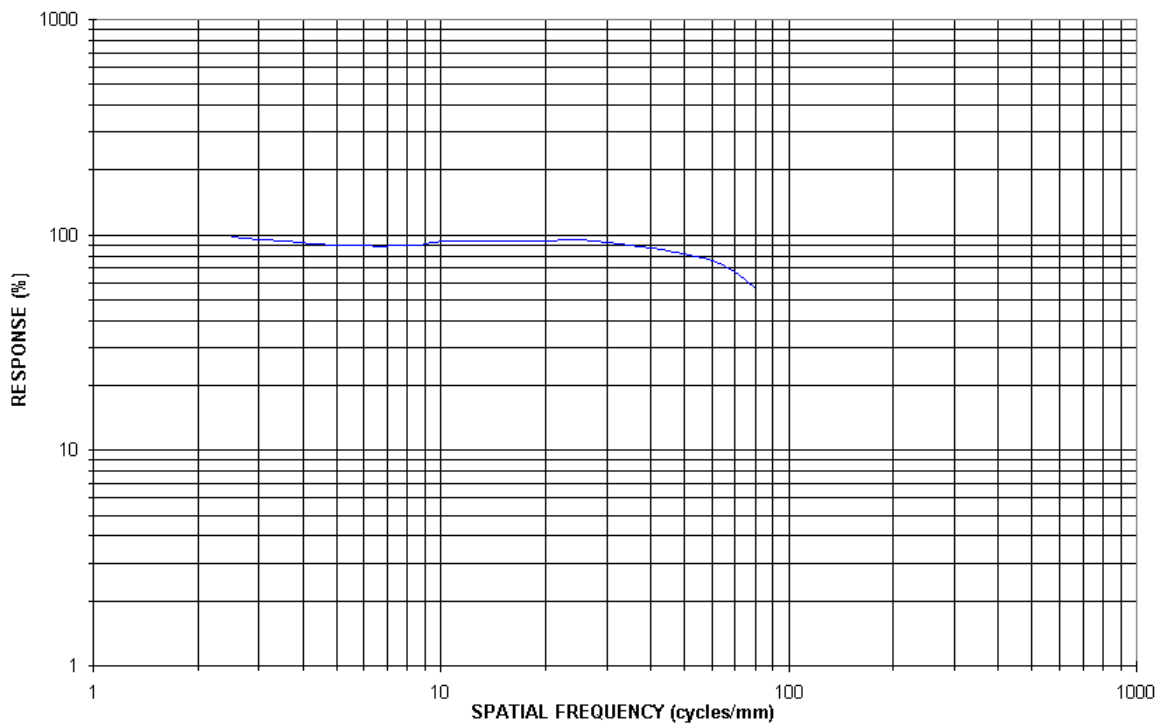
TI2292C 4-01
CHARACTERISTIC, For Publication
KODAK Panchromatic Sound Recording Film 2374
Tungsten (2850K) plus KODAK Heat Absorbing Glass, No.2043,1/1000 sec.
KODAK Developer D-97, 4 min, 75F (24C); Diffuse visual



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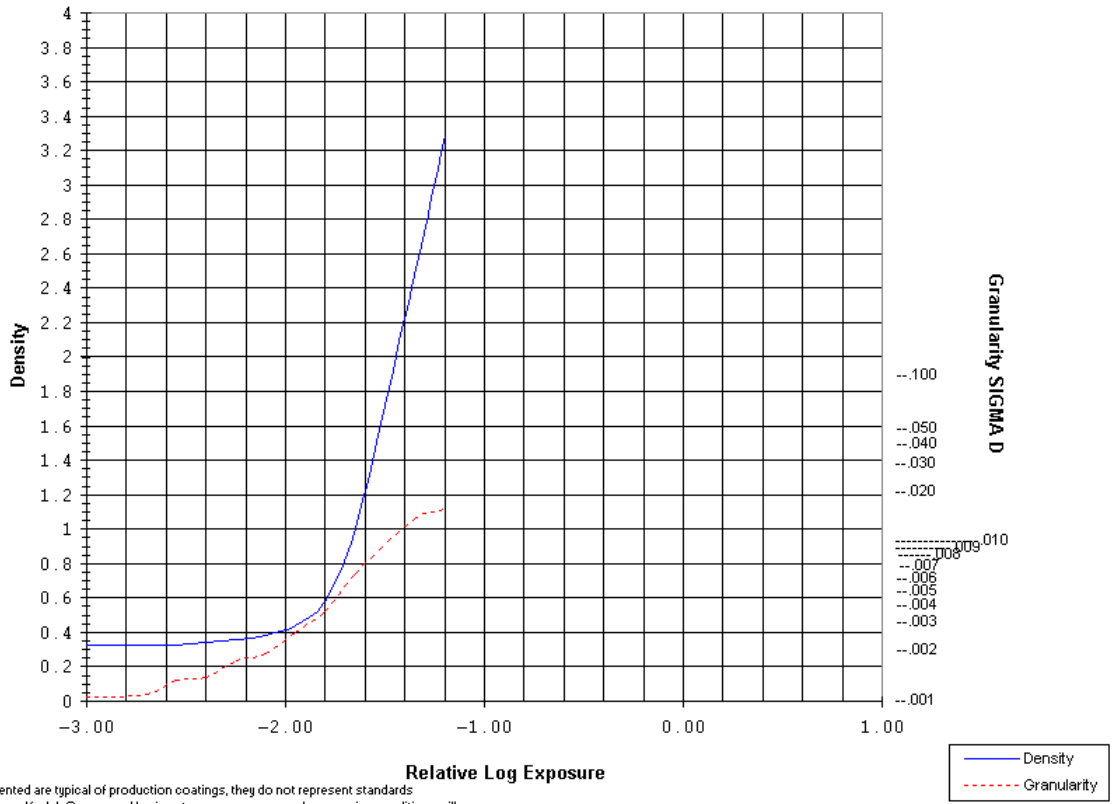
TI2292D 3-01
MTF, For Publication

KODAK Panchromatic Sound Recording Film 2374
Tungsten, KODAK Developer D-97, 35%, Diffuse visual



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TI2292E 03-01
 DIFFUSE rms GRANULARITY, For Publication
 KODAK Panchromatic Sound Recording Film 2374
 Granularity vs. Density; Process D-97; Status M



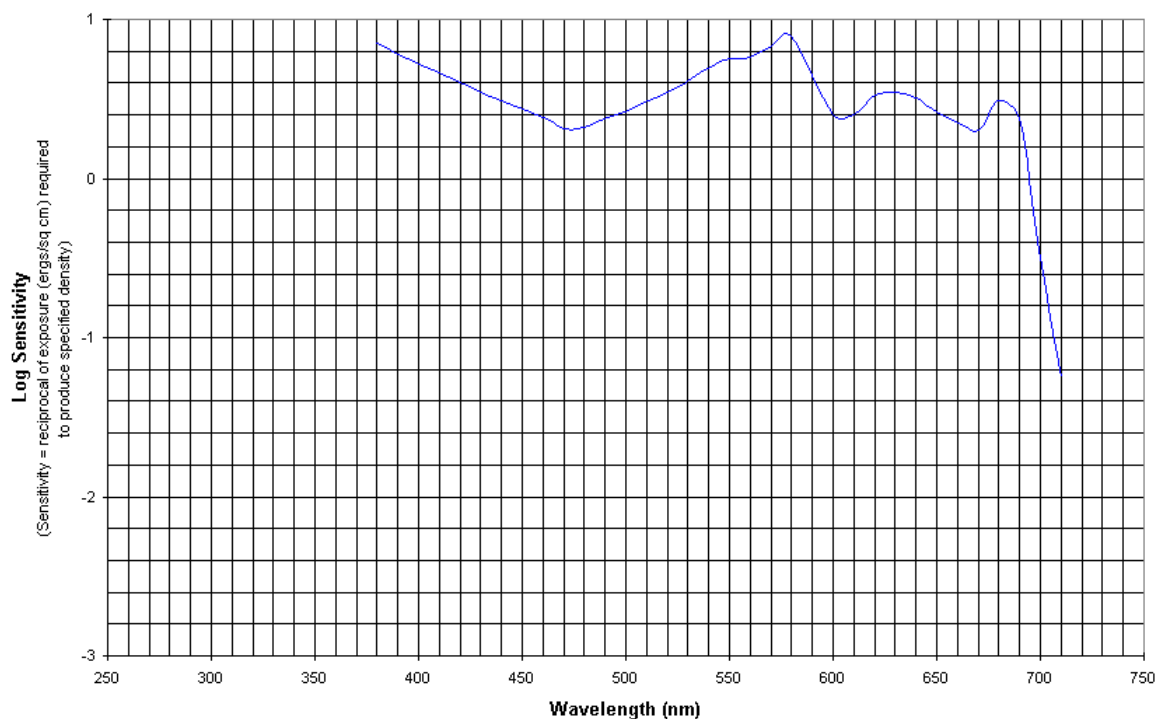
Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI2292F 3-01

SPECTRAL SENSITIVITY, For Publication

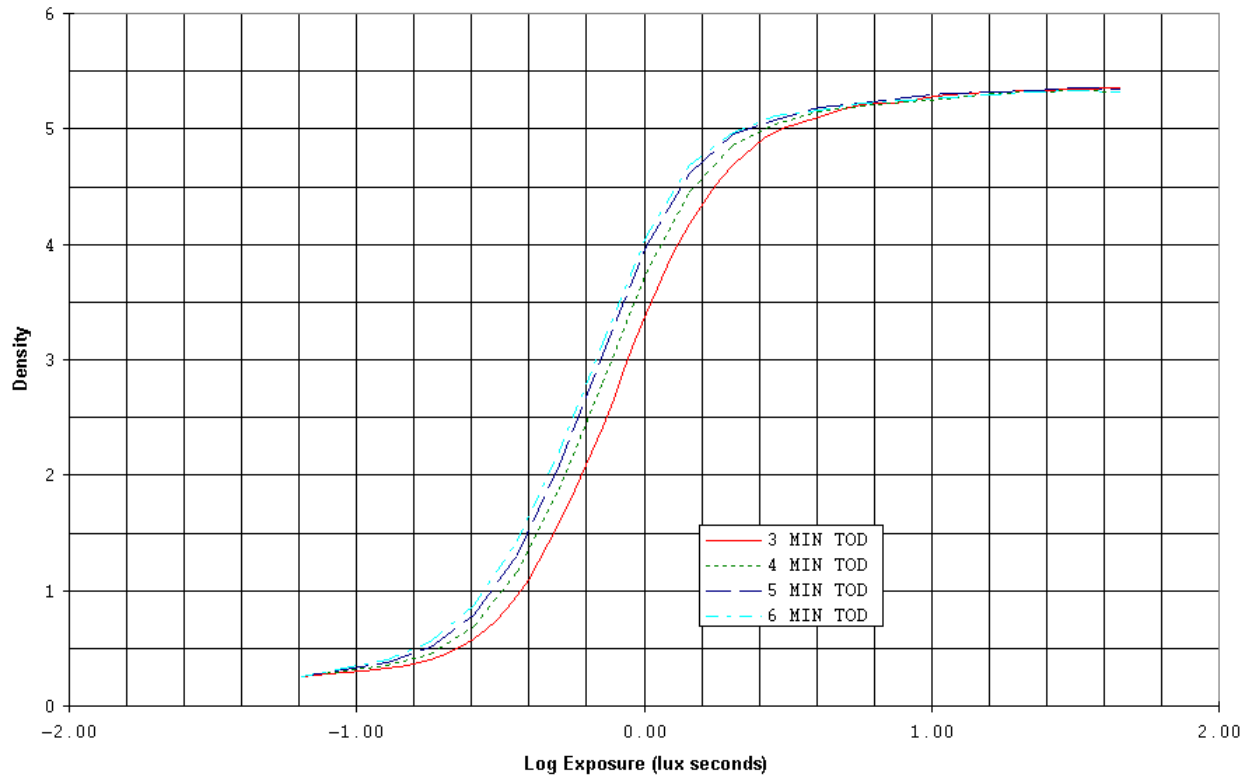
KODAK Panchromatic Sound Recording Film 2374

Effective exp 1.4 sec; KODAK Developer D-97; Diffuse visual; 1.0>D-min



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TI2292G 3-01
CHARACTERISTIC - TIME OF DEVELOPMENT, For Publication
KODAK Panchromatic Sound Recording Film 2374
Tungsten (2850K) plus KODAK Heat Absorbing Glass, No.2043,1/1000 sec.
Diffuse visual



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