

## EASTMAN EXR Sound Recording Film 2378E, 3378E (ESTAR)

### 1) Description

EASTMAN EXR Sound Recording Film 2378E, 3378E (ESTAR) is a high contrast, orthochromatic black-and-white film designed for recording variable-area sound track negatives with a tungsten light source, and/or producing digital sound track negatives.

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).

### 2) Base

EASTMAN EXR Sound Recording Film 2378E, 3378E has a gray ESTAR safety base.

### 3) Darkroom Recommendations

Use a KODAK 2 Safelight Filter / Dark Red, with a 15-watt bulb, no closer to the film than 1.2 meters (4 feet).

### 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 2.5 and 3.8.

For each specific print density, there exists an optimal negative density that will result in minimum distortion, with the proper image spread, in the reproduced sound. The density of the negative having this desired amount of image spread can be determined on the basis of cross-modulation and listening tests. <sup>2</sup>

**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.

**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 EASTMAN Motion Picture Films, Module 15*. The processing times may require modification for a particular machine.

**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 <sup>[1]</sup>	75 +-1/2°F (23.9 +-0.3°C)	4 min <sup>[2]</sup>	650 (D-97RS)	325 (D-97RS)
Stop Rinse <sup>[3]</sup>	75 +-2°F (24 +-1°C)	50 sec	12,000	6,000
KODAK Fixing Bath F-5 <sup>[1]</sup>	75 +-2°F (24 +-1°C)	9 min	600	300
Wash (counter-current)	75 +-2°F (24 +-1°C)	10 min	12,000	6,000
Dry	95°F(35°C)	. <sup>[4]</sup>		

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

<sup>[2]</sup>Do not overdevelop this film to the point where it greatly increases fog level. This will cause a reduction in sound quality.

<sup>[3]</sup>Use a countercurrent flow of fixer-laden water overflow from the wash tank, pH about 6.

<sup>[4]</sup>Drying depends on many factors such as air temperature, relative humidity, volume and rate of air flow, flow distribution pattern, final squeegeeing, etc. In a typical motion picture film drying cabinet with air at about 95°F (35°C) 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.

<sup>2</sup>J. 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>.

## 7) Identification

After processing, the words 'EASTMAN Safety Film', the strip number, and year symbol are visible along the length of the film.

## 8) Image Structure

The modulation-transfer curves and the diffuse rms granularity data were generated from samples of 5378 Film<sup>3</sup> exposed with tungsten light and processed as recommended in KODAK Developer D-97 at 75°F (24°C). For more information on image-structure characteristics, see KODAK Publication No. H-1, *Kodak Motion Picture Film*.

### rms Granularity<sup>4</sup>

Granularity = 6

## 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.

## 10) Graphs<sup>5</sup>

### MTF

A) (2-95)

**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 60 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.

### Characteristic

B) Normal exposure (6-95)

C) Exposed using 580BP Filter at 100 microseconds/Simulated for Green LED Exposure (6-95)

### Spectral Sensitivity

D) (2-95)

**Note:** The Kodak materials described in this publication for use with EASTMAN EXR Sound Recording Film 2378E, 3378E 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, 2378, 3378, 2383, 2393, 2395, 3395, 5302, 7302, and Estar are trademarks.**

Entertainment Imaging  
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End of Data Sheet

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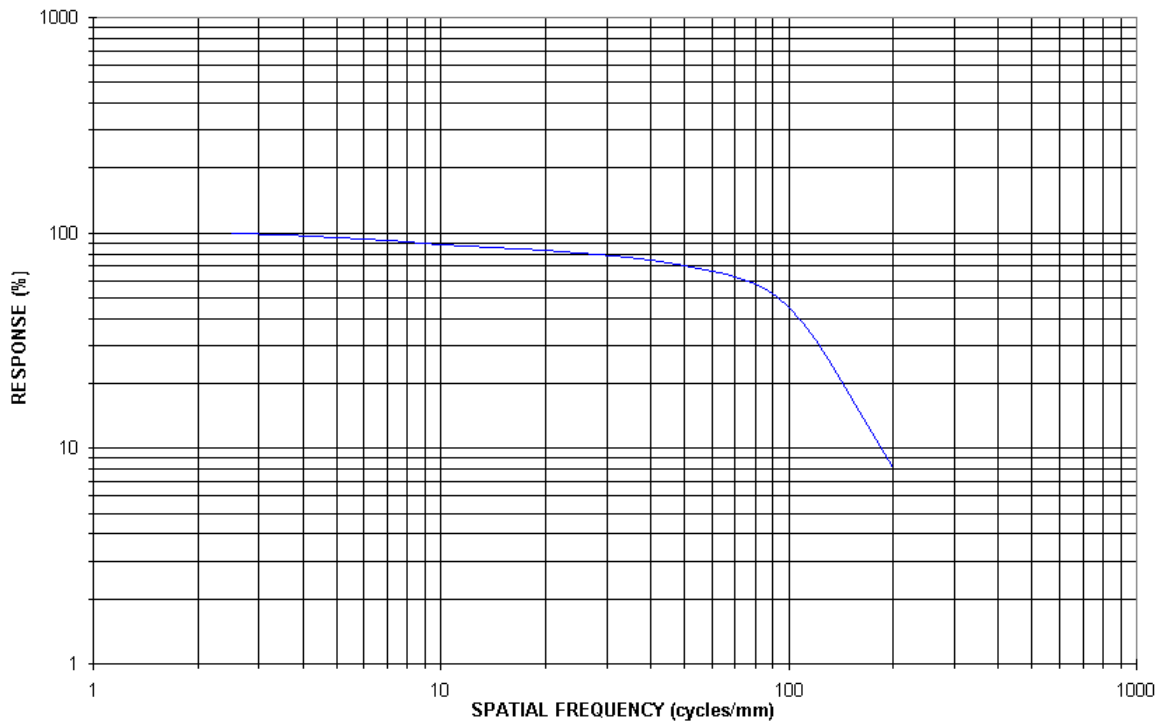
<sup>3</sup>5378 and 7378 Films have been discontinued.

<sup>4</sup>Read at a net diffuse visual density of 1.0 using a 48-micrometer aperture.

<sup>5</sup>NOTICE: 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.

TI2125A 2-95  
MTF, For Publication

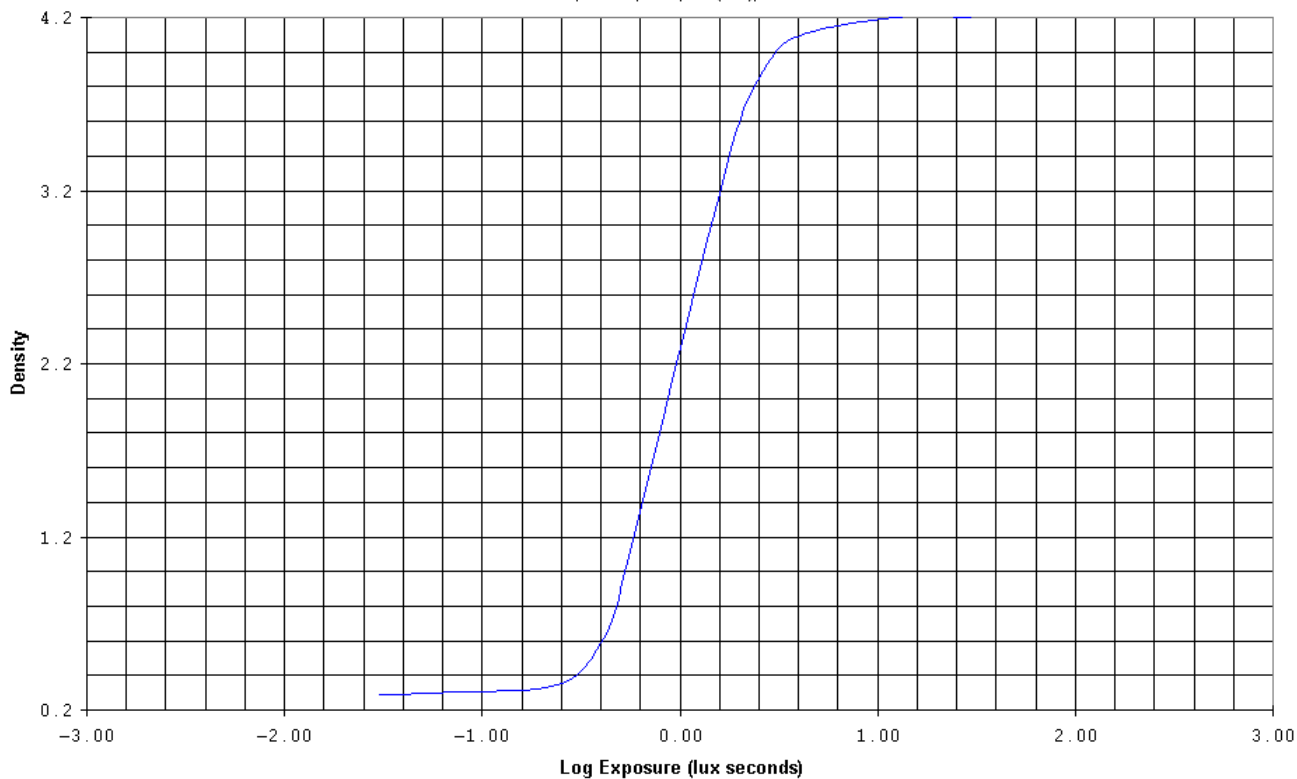
EASTMAN EXR Sound Recording Film 2378/3378  
Tungsten, KODAK Developer D-97; Diffuse visual



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**TI2125B 6-95**  
CHARACTERISTIC, For Publication

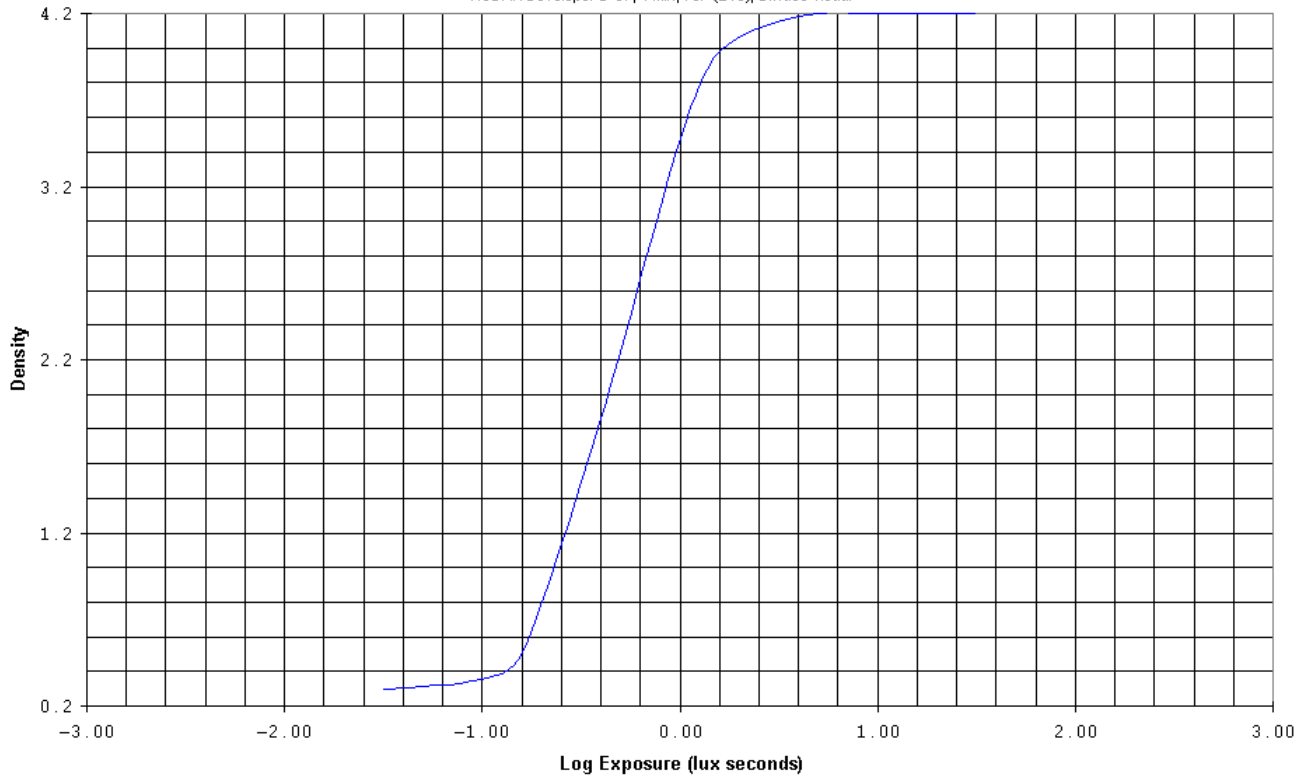
EASTMAN EXR Sound Recording Film 2378/3378  
Tungsten (2850K) plus KODAK Heat Absorbing Glass, No.2043,1/11000 sec.  
KODAK Developer D-97, 4 min, 75F (24C); Diffuse visual



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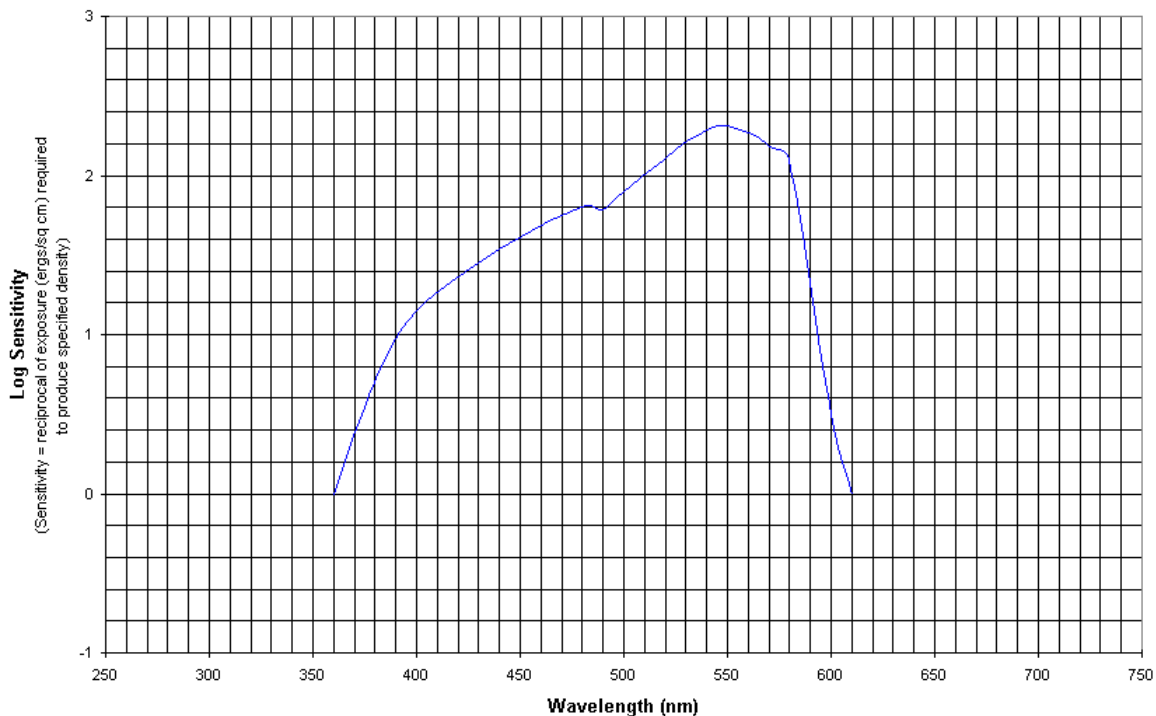
**TI2125C 6-95**  
CHARACTERISTIC, For Publication

EASTMAN EXR Sound Recording Film 2378/3378  
Simulated for Green LED Exposure  
Tungsten (2850K) plus KODAK Heat Absorbing Glass, No. 2043, 580BP Filter, 100 microseconds;  
KODAK Developer D-97, 4 min, 75F (24C); Diffuse visual



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**TI2125D 2-95**  
SPECTRAL SENSITIVITY, For Publication  
EASTMAN EXR Sound Recording Film 2378/3378  
Effective exp 1.4 sec; KODAK Developer D-97; Diffuse visual



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