

SEMI D22-0999

TEST METHOD FOR THE DETERMINATION OF COLOR, TRANSMITTANCE OF FPD COLOR FILTER ASSEMBLIES

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1 Purpose

1.1 This standard establishes practices for measuring selected characteristics of FPD color filters. These methods are applicable to manufacturing, quality control, and development operations.

2 Scope

2.1 This document defines means to measure.

2.2 Transmittance and chromaticity of color filter elements by measuring the characteristics of flux passed through a subpixel.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 SEMI Standards

SEMI D13 — Terms and Definitions for FPD Color Filter Assemblies

3.2 ASTM Standards¹

ASTM D523 — Standard Test Method for Specular Gloss

ASTM E430 — Standard Test Methods for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry

ASTM E1392 — Standard Practice for Angle Resolved Optical Scatter Measurements on Specular or Diffuse Surfaces

ASTM F1049 — Test Method for Measuring the Effective Surface Roughness of Optical Components by Total Integrated Scattering

3.3 ISO Standard²

ISO 5-2 — Photographic Density Measurements, Part 2: Geometric Conditions for Transmission Density

3.4 CIE Standards³

CIE 1931 — Standard Colorimetric System (Colorimetry – Official Recommendations of the CIE)

CIE 1976 (L^*, a^*, b^*) — Color Space (Recommendations on Uniform Color Spaces)

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Terminology

4.1 None.

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, <http://www.astm.org>

² International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland; Telephone: +41.22.749.01.11, <http://www.iso.org>

³ CIE International Commission on Illumination, Kegelgasse 27, A-1030 Vienna, Austria

5 Summary of Method

5.1 The measurement equipment is set to appropriate illumination wavelength, incident beam angle, and spot size.

5.2 For measurements of chromaticity and spectral transmittance.

5.2.1 The sample to be measured is placed on the stage and the illumination spot is located on an area free of color filter or other coating material for a reference sample.

5.2.2 Reference data is taken and only the other coating material for the reference is removed.

5.2.3 The sample is repositioned to place the illumination spot on the desired target area and the sample data is taken.

5.3 Measurement data for both reference and color filter are recorded.

5.4 A graph of the resulting data is prepared.

6 Apparatus

6.1 Measurement equipment shall have the following capabilities:

6.1.1 Optical wavelength: variable between 380 and 780 nm, in increments of ≤ 10 nm.

6.1.2 Measurement spot size of incident beam at sample surface: adjustable from 2 μm to 50 μm .

6.1.3 Incident beam angle, relative to sample normal.

6.1.3.1 For transmittance measurements: $0^\circ \pm 5^\circ$.

6.1.4 Sample stage: sufficient mechanical travel to permit measurements within the color filter area and in the transparent area of the substrate outside the color filter material.

7 Reference Material

7.1 For transmittance measurements, use the sample to be measured and measure transmittance in a portion of the surface that is clear of color filter material. This establishes the level against which transmittance of the area containing the color filter material is compared.

8 Calibration

8.1 Calibrate the equipment in accordance with manufacturer's instructions.

8.2 Record characteristics of the instrument observed during this calibration, for example, linearity, phase shift, etc.

9 Measurement Procedure

9.1 Place the sample(s) on the stage of the measurement equipment.

9.1.1 Set equipment properties for desired values as follows:

9.1.1.1 Wavelength,

9.1.1.2 Spot size,

9.1.1.3 Incident beam angle,

9.1.2 Measure reference surface and record results, and

9.1.3 Measure color filter area at desired locations and record results.

10 Report

10.1 Data and time of test; operator ID.

10.2 Equipment manufacturer, model, serial number and software revision.

10.3 Reference material used.

10.4 Equipment set-up (wavelength, spot size, beam angle).