

SEMI D30-0707 (Reapproved 1113) TEST METHOD FOR LIGHT RESISTANCE IN FLAT PANEL DISPLAY (FPD) COLOR FILTERS

This Standard was technically approved by the Flat Panel Display – Color Filter & Optical Elements Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on August 22, 2013. Available at www.semiviews.org and www.semi.org in November 2013. Originally published November 2001; previously published July 2007.

1 Purpose

1.1 The purpose of this Document is to standardize the method for measurement of light resistance in color filters used for flat panel displays (FPD).

2 Scope

2.1 This method is to be used by suppliers and users of FPD color filters to measure quality in products as well as items under development.

2.2 This method shall be used in general FPD production to test the resistance of color filters to light.

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 and Safety Guidelines

SEMI D19 — Test Method for Chemical Resistance of FPD Color Filter

SEMI D22 — Test Method for the Determination of Color, Transmittance of FPD Color Filter Assemblies

3.2 ISO Standards¹

ISO 4892 — Methods of Exposure to Laboratory Light Sources

ISO 7724^{2,3} — Paints and Varnishes – Colorimetry

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

4 Terminology

4.1 Definitions

4.1.1 *atomic force microscope (AFM)* — a device which precisely measures surface shape by gauging the reciprocal active force between atoms through use of a probe.

4.1.2 *fade meter* — a device which tests for the existence of external change or characteristics in materials by long term irradiation using fixed brilliance from a prescribed light source.

4.1.3 *confocal scanning laser microscope* — a microscope which is able to create an image of just the focal point by concentrating light on a specimen using a confocal laser. This device can also measure surface shape by recording height information, which matches the focal point of each scans line image.

¹ International Organization for Standardization, ISO Central Secretariat, 1 rue de Varembé, Case postale 56, CH-1211 Geneva 20, Switzerland. Telephone: +41.22.749.01.11; Fax: +41.22.733.34.30; <http://www.iso.ch>

² Available in Japanese as JIS Z8730 — Method for Specification of Color Differences for Opaque Material.

³ The expression method of its colour differences is equal to the method defined in Publication of CIE No. 87 (1990) Parametric Effects in Color – Difference Evaluation. Commission Internationale de l'Eclairage, Kegelgasse 27, A-1030 Vienna, Austria; Telephone: +43.1.714.31.87.0

5 Summary of Method

- 5.1 Measure spectral transmittance, chromaticity, and surface shape of specimen.
- 5.2 Place specimen in light exposure apparatus and irradiate for specified length of time.
- 5.3 Remove specimen from light exposure apparatus.
- 5.4 Observe visually and by microscope to see if any exterior changes have occurred in the specimen.
- 5.5 Measure spectral transmittance, chromaticity, and surface shape of specimen.

6 Apparatus

6.1 *Light Exposure Apparatus* — Choose a test device to use from the following devices and specify which device was used in the report.

6.1.1 Sunshine carbon-arc fade meter,

6.1.2 Xenon-arc fade meter.

6.2 *Measuring and Inspection Devices*

6.2.1 *Color Illuminator* — This light source shall have chromaticity, color rendering, luminance and intensity uniformity, diffusion, and a sufficient illumination area for observation of the specimen to be measured (see SEMI D19).

6.2.2 *Floodlight* — This light shall have luminance uniformity and an illumination area sufficient for the specimens to be measured (see SEMI D19).

6.2.3 *Microscope* — Use a microscope which has either transmitted illumination or reflected illumination, or both, and has a sufficient magnification ratio (see SEMI D19).

6.2.4 *Spectrophotometer* — The spectrophotometer shall be in conformance with SEMI D22.

6.2.5 *Surface Shape Measurement Device* — Use a Stylus-type surface roughness measurement (film thickness measurement) device, AFM or laser microscope.

7 Test Conditions

7.1 The principle test conditions are described in Table 1. In the case where tests are performed under conditions in addition to these, clearly state those conditions.

Table 1 Test Conditions

<i>Item</i>	<i>Device</i>	<i>Test Interval</i>	<i>Color Filter Condition</i>	<i>Evaluation Item</i>	<i>Reference Standard</i>
1	Sunshine Carbon-arc Fade Meter	100 hours ±5%	With/Without ITO Glass Surface Irradiation	1. External Change 2. Color Difference ΔE^*_{ab} or ΔE^*_{uv}	ISO 4892 ISO 7724
2	Xenon-arc Fade Meter	500 hours ±5%	With/Without Polarizing Film	3. Transmittance Change	

8 Test Specimen

8.1 Use FPD color filters for specimens. In the test results, note the existence or non-existence of Transparent Conductive Film (ITO etc.) and a Polarizing Film. Specimen used in the test are cut to an appropriate size for the specified holder of the equipment above, and fastened at the specified distance from the light source. At this time, in order to test in conditions close to actual use, a Polarizing Film is attached to the glass surface, and light is radiated from this side.