

SEMI D64-0811

TEST METHOD FOR MEASURING THE SPATIAL CONTRAST RATIO OF FLAT PANEL DISPLAY

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1 Purpose

1.1 Contrast has a significant influence on the perceived image quality in display devices.

1.1.1 For several decades, physical contrast metrics such as contrast ratio (CR) and contrast modulation (CM) have been widely used to quantify the contrast performance of display devices.

1.1.2 A robust standardized test method for measuring the APL (average picture level) contrast ratios of flat panel display (FPD) systems is required to enable quality control in high volume manufacturing.

1.1.3 Existing international standards use full screen sequential test patterns that are not suitable for modern FPD systems that dynamically adjust gray levels based on image contents. International standards (IEC, ISO, and VESA FPDm) define the contrast ratio (CR) and contrast modulation (CM).

1.1.3.1 Sequential full screen test pattern does not give constant results for the new display technologies that dynamically adjust gray levels based on image contents.

1.1.3.2 The test pattern where regions of various APL exist inside one image, therefore, is more reliable to assess the display device in terms of contrast ratio. APL values of various images, therefore, should be considered.

1.2 Consequently, this Test Method requires a pair of specified test patterns with APL variation, rather than sequential APL variation, used to evaluate the APL contrast ratio of a display device under test.

2 Scope

2.1 This Standard is applicable to flat panel displays (FPD).

2.2 The scope of the term 'contrast' is only related to the luminance contrast in this Standard.

2.3 The test method in this Standard uses APL test patterns with the APL specified for both the region under test and the background region to determine the APL contrast ratio.

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 Limitations

3.1 This Test Method does not apply to perceptual contrast measurement.

3.2 Measurements of FPD contrast ratio that do not adhere to this Test Method may report different results than those obtained using this Test Method.

3.3 Measurements are subject to errors or imprecision due to the user, environmental factors, and miscalibration of measurement system or measurement system limitations.

3.4 Results may vary with ambient illumination conditions or in the presence of uncontrolled stray light reflections.

4 Referenced Standards and Documents

4.1 CIE Standards¹

CIE 87 — Colorimetry of Self-Luminous Displays – A Bibliography

CIE 15.3 —Colorimetry

4.2 IEC Standards²

IEC 61947-1 — Electronic Projection – Measurement and Documentation of Key Performance Criteria – Part 1: Fixed Resolution Projectors

IEC 62087 — Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment

4.3 ISO Standards³

ISO/FDIS 9241-307 — Ergonomics of Human-System Interaction – Part 307: Analysis and Compliance Test Methods for Electronic Visual Displays

4.4 VESA Standards⁴

VESA 2.0 — Flat Panel Display Measurement Standard (FPDM)

4.5 Other Documents

Keller, Peter A. “Electronic Display Measurement.” Wiley, 1997.

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 *ACR* — average picture level contrast ratio

5.1.2 *APL* — average picture level

5.1.3 *CM* — contrast modulation

5.1.4 *CR* — contrast ratio

5.1.5 *DUT* — display under test

5.1.6 *LMD* — light measurement device

5.1.7 *SCR* — spatial contrast ratio

5.2 Definitions

5.2.1 *average picture level (APL)* — the average level of the picture signal during active scanning time integrated over frame period; defined as a percentage of the range between blanking and reference white level.

5.2.2 *APL contrast ratio* — the contrast ratio obtained using a pair of test patterns with APL specified both for the region under test and the background region.

5.2.3 *contrast ratio* — the ratio of the luminance of the brightest gray on the center point of the screen to that of the darkest gray on the same point of the screen. The metric is shown in Equation 1.

¹ Commission Internationale De L'eclairage (International Commission On Illumination), Kegelgasse 27, A-1030 Vienna/AUSTRIA. Telephone: +43.1.714.31.87.0. Fax: +43.1.714.31.87.18; <http://www.cie.co.at>

² International Electrotechnical Commission, 3 rue de Varembé, Case Postale 131, CH-1211 Geneva 20, Switzerland; Telephone: 41.22.919.02.11, Fax: 41.22.919.03.00, <http://www.iec.ch>

³ 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>

⁴ Video Electronics Standards Association, 39899 Balentine Dr., Suite 125, Newark, CA 94560, USA. Telephone: 510.651.5122; Fax: 51.651.5127; <http://www.vesa.org>