IEC TR 62977-1-31

Edition 1.1 2022-03
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

colour inside

Electronic displays –
Part 1-31: Generic – Practical information on the use of light measuring devices

IEC TR 62977-1-31:2021-04+AMD1:2022-03 CSV(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.120; 31.260

ISBN 978-2-8322-4572-9

IEC TR 62977-1-31

Edition 1.1 2022-03
CONSOLIDATED VERSION

REDLINE VERSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRONIC DISPLAYS –

Part 1-31: Generic – Practical information on the use of light measuring devices

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC TR 62977-1-31 edition 1.1 contains the first edition (2021-04) [documents 110/1258/DTR and 110/1281A/RVDTR] and its amendment 1 (2022-03) [documents 110/1380/DTR and 110/1404A/DVDTR].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

IEC TR 62977-1-31 has been prepared by IEC technical committee 110: Electronic displays. It is a Technical Report.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 62977 series, published under the general title *Electronic displays*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under webstore.iec.ch in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Measurements of the optical characteristics of electronic displays are primarily affected by three factors: measuring procedures, displays (devices under test: DUTs), and light measuring devices (LMDs), for which there are many international standards supporting consistent and comparable measurements. Most of them, however, provide only limited information on LMDs, making it difficult to appropriately select and use the LMD for the measurement objective. The purpose of this document is to provide best practices and suggestions which are missing in the standards.

This document addresses how the major properties of a typical LMD affect the measurement results. It is often impractical and unnecessary to consider the influences of all properties of LMDs and all characteristics of DUTs as well as their interactions and influences on the measurement results. Therefore, the multiple interaction effects that exist are beyond the scope of this document. Due to the rapid innovation and abundance of LMDs, covering all types of LMDs is also outside the objectives of this document.

INTRODUCTION to Amendment 1

This document provides additional information to IEC TR 62977-1-31:2021 regarding the influence of spectral stray light and spectral bandwidth of a spectroradiometer on chromaticity measurements. It is described in Annex E.

This document also provides the corrections of editorial errors of IEC TR 62977-1-31:2021. The corrections are:

– Typos are fixed:
  - “fiber” and “$x(\lambda)$, $y(\lambda)$, $z(\lambda)$” is replaced with “fibre” and “$\overline{x}(\lambda), \overline{y}(\lambda), \overline{z}(\lambda)$”, respectively in Figure 2,
  - “(%)” in the label of vertical axis is removed in Figure 9, Figure 10, and Figure 12,
  - “0” label of the tick mark of vertical axis is replaced with “1” in Figure C.4.
– The lists for Formula (A.1) and Formula (B.1) are aligned.

ELECTRONIC DISPLAYS –

Part 1-31: Generic – Practical information on the use of light measuring devices

1 Scope

This part of IEC 62977 provides practical information on light measuring devices (luminance meters, colorimeters, and spectroradiometers) with luminance measuring optics for the characterization of electronic displays.

2 Normative references

There are no normative references in this document.

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at http://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

NOTE CIE Electronic international lighting vocabulary (e-ILV) is also available at http://cie.co.at/e-ilv.

3.1.1
repeatability
<of an LMD> closeness of agreement between indications or measured quantity values obtained by replicated measurements over a short period of time using a specific LMD under conditions specified by the LMD manufacturer

Note 1 to entry: Repeatability of an LMD is usually expressed numerically by statistical quantities, such as standard deviation, variance, or coefficient of variation (relative standard deviation) under the specified conditions of measurement.

Note 2 to entry: The influence on measurement repeatability caused by fluctuations of the measured light source and by the measurement procedure is assumed to be negligible when the manufacturer specifies the repeatability of an LMD. Manufacturers often specify the type of light source and measurement conditions used for determining the repeatability of an LMD.

Note 3 to entry: Measurement precision is the closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions. Measurement repeatability is measurement precision under a set of repeatability conditions of measurement that includes the same measurement procedures, same operators, same measuring system, same operating conditions, same location, and replicate measurements on the same or similar objects over a short period of time. Measurement reproducibility is measurement precision under a set of reproducibility conditions of measurement that includes different locations, operators, measuring systems, and replicate measurements on the same or similar objects [1], [2][1].

[1] Numbers in square brackets refer to the Bibliography.

3.1.2
accuracy
<of an LMD> difference between a measured quantity value and an accepted reference value when using a specific LMD under conditions specified by the LMD manufacturer

Note 1 to entry: This term is a quantity with a numerical value and is usually expressed as a range specification.

Note 2 to entry: The accepted reference value is a value that serves as an agreed-upon reference for comparison, and which is derived as:

a) a theoretical or established value, based on scientific principles;

b) an assigned or certified value, based on experimental work of some national or international organization;

c) a consensus or certified value, based on collaborative experimental work under the auspices of a scientific or engineering group;

d) (when a), b) and c) are not available) the expectation of the (measurable) quantity, i.e. the mean of a specified population of measurements [3].

Note 3 to entry: The influence on measurement accuracy caused by fluctuations of the measured light source and by the measurement procedure is assumed to be negligible when the manufacturer specifies the accuracy of an LMD. Manufacturers often specify the type of light source and other measurement conditions used for determining the accuracy of an LMD.

Note 4 to entry: Measurement accuracy is the closeness of agreement between a measured quantity value and the true quantity value of a measurand [1], [2]. The accuracy of measurement is not a quantity value while the accuracy of an LMD is a quantity value; thus, the term "accuracy" conventionally used for the specification of LMDs means something different than that used for measurement.

3.2 Abbreviated terms

CIE	Commission Internationale de l'Éclairage (International Commission on Illumination)
CMF	colour-matching function
DUT	device under test
EOTF	electro-optical transfer function
LCD	liquid crystal display
LED	light emitting diode
LMD	light measuring device
ND	neutral density
OLED	organic light emitting diode
PWM	pulse width modulation
RGB	red, green, and blue
RGBW	red, green, blue, and white
Vsync	vertical synchronizing signal

4 General information on LMDs for photometry and colorimetry

4.1 General

Clause 4 describes the principles of photometry and colorimetry, configuration, calibration, and maintenance of LMDs, as well as setup conditions for measurement.

4.2 Photometry and colorimetry for electronic displays

Photometry is the measurement of quantities referring to radiation as evaluated according to a given spectral luminous efficiency (see IEV 845-25-013). Colorimetry is the measurement of colour stimuli based on a set of conventions (see IEV 845-25-014). Details on the calculation formulae and specific conditions applied to electronic display measurement are shown in Annex A.