

ICS 17.180.20
CCS K 71



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 20151-2026

Replacing GB/T 20151-2006

Photometry - The CIE system of physical photometry

光度学 CIE物理光度系统

(English Translation)

Issued on: January 28, 2026

Implemented on: January 28, 2026

Issued by: State Administration for Market Regulation

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document replaces GB/T 20151-2006 "Photometry, CIE Physical Photometric System". Compared with GB/T 20151-2006, except for the following.

Aside from structural adjustments and editorial changes, the main technical changes are as follows.

---The scope of the document has been changed to include the spectral luminous efficiency functions for intermediate vision and 10° photopic vision published by the CIE (see...).

Chapter 1 (Chapter 1 of the 2006 edition);

---Added the International System of Units (SI) and its formulaic revisions to the definition of the candela, which came into effect on May 20, 2019 (see 4.1);

---Added specific requirements regarding the use of units, list values, and intermediate value interpolation (see 8.3.2).

This document is modified to adopt ISO/CIE 23539.2023 "Photometry, CIE Physical Photometric System".

This document has undergone the following structural adjustments compared to ISO/CIE 23539.2023.

---Appendix A corresponds to Appendix C of ISO/CIE 23539.2023;

---Appendix B corresponds to Appendix A of ISO/CIE 23539.2023;

---Appendix C corresponds to Appendix D of ISO/CIE 23539.2023;

---Appendix D corresponds to Appendix B of ISO/CIE 23539.2023.

The technical differences between this document and ISO/CIE 23539.2023, and the reasons therefor, are as follows.

---CIES017 has been replaced with the normatively referenced GB/T 2900.65 to suit my country's national conditions (see Chapter 3).

The following editorial changes have been made to this document.

---The referenced table has been corrected; "Table 7" has been changed to "Table 6" (see 7.5, 7.5 of ISO/CIE23539.2023).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China National Light Industry Council.

This document is under the jurisdiction of the National Technical Committee on Standardization of Lighting Appliances (SAC/TC224).

Introduction

The purpose of photometry is to measure the light perceived by the human eye. The brightness of a luminous surface depends not only on whether it emits, transmits, or reflects light.

The amount of radiation also depends on its spectral composition and the observer's visual response function. This is because the human eye's visual response varies under different illumination levels.

The results vary from person to person, and accurate photometric measurements require defining representative standard observers. The CIE Physical Photometric System clearly defines the standard observers according to national standards.

The internationally recognized method for quantitatively evaluating light radiation is the spectral luminous efficiency function. $V(\lambda)$ represents photopic vision, $V'(\lambda)$ represents scotopic vision, and V_{mes} represents...

The spectral luminous efficiency function represents intermediate vision between photopic and scotopic vision, and $V_{10}(\lambda)$ represents 10° photopic vision.

The system adopted in 018.2019 and BIPM-2019/05, combined with the International System of Units (SI) base unit candela, forms a system capable of...

Based on SI, the optical radiation and photometric values of luminescent, transmissive, and reflective surfaces are accurately calculated, regardless of the spectrum of their emitted, transmitted, or reflected radiation.

The influence of composition.

The CIE Physical Photometric System has certain limitations in evaluating the apparent brightness of colored surfaces. for two different colors but different brightness measurements...

The perceived brightness of the same light source may differ from person to person. Therefore, the CIE has released more complex models for specific scenarios.

200.2011). For non-imaging light mediated by the eye, which is partially or entirely induced by intrinsically photosensitive retinal ganglion cells (ipRGCs).

Effects, using CIES026/E.2018.

Photometry CIE Physical Photometric System

1 Scope

This document defines the characteristics of the physical photometric system established and recognized by the International Commission on Illumination (CIE) as the basis for photometry.

The document also defines the measurements, units, and standards of photometry that constitute the CIE physical photometric system and are formally adopted by the International Committee for Weights and Measures (CIPM).

Meaning includes.

---Definition of photometric measurements, symbols, and units;

---Definitions of the CIE standard spectral luminous efficiency function for photopic vision,

scotopic vision, intermediate vision, and 10° photopic vision;

---The CIE standard definition of a photometric observer that conforms to these functions;

---Definition of maximum photopic visual efficiency for photopic vision, scotopic vision, mesovision, and 10° photopic vision.

This document applies to applications related to photometric calculation, photometric measurement, and evaluation.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

GB/T 2900.65 Electrical Engineering Terminology - Lighting (GB/T 2900.65-2023, IEC 60050-845:2020, IDT)

3 Terms and Definitions

The terms and definitions defined in GB/T 2900.65 and the following terms and definitions apply to this document.

CIE Observer

The relative spectral responsivity conforms to the CIE definition of the spectral luminous efficiency function for human vision and follows the superposition implied in the definition of luminous flux.

An ideal observer of the law of addition.

Note 1: The CIE defines the photopic spectral luminous efficiency function $V(\lambda)$ and the scotopic spectral luminous efficiency function $V'(\lambda)$, corresponding to the CIE standard photometric observer.

In addition, the CIE also defines the mesoscopic spectral luminous efficiency function $V_{mes;m}(\lambda)$, the 10° photopic spectral luminous efficiency function $V_{10}(\lambda)$, and the frustum-based luminous efficiency function.

CIE photometric observer of the spectral light efficiency function of cells (see CIE170-2.2015).

Note 2: The CIE photometric observer differs from the CIE standard photometric observer, which only includes the photopic spectral luminous efficiency function $V(\lambda)$ and the scotopic spectral