

ICS 27.160



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

GB/T 46984.1-2025

**Photovoltaic cells - Part 1: Measurement of light-induced
degradation of crystalline silicon photovoltaic cells**

光伏电池 第1部分：晶体硅光伏电池光致衰减试验方法

(English Translation)

Issued on: December 31, 2025

Implemented on: April 1, 2026

Issued by: State Administration for Market Regulation

Table of Contents

Foreword...	3
Introduction...	5
1 Scope...	7
2 Normative references...	7
3 Terms and definitions...	8
4 Equipment and instruments...	8
5 Sample preparation...	8
6 Test procedure...	9
7 Test report...	10

1 Scope

This document specifies the method for testing the light-induced degradation of crystalline silicon photovoltaic cells under simulated light sources. The light-induced degradation value of the crystalline silicon photovoltaic cell is obtained by comparing the maximum output power of the photovoltaic cell before and after the test under standard test conditions (STC). The test shall be conducted at the given temperature and irradiance.

This document applies to the testing of light-induced degradation of crystalline silicon photovoltaic cells.

2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for any dated reference, only the version corresponding to that date applies to this document; for any undated reference, the latest version (including all amendments) applies to this document.

IEC 60904-1 Photovoltaic devices - Part 1.Measurements of photovoltaic current- voltage characteristics

NOTE: GB/T 6495.1-2025 Photovoltaic devices - Part 1.Measurement of photovoltaic current-voltage characteristics (IEC 60904-1.2020, IDT)

IEC 60904-2 Photovoltaic devices - Part 2.Requirements for photovoltaic reference devices

NOTE: GB/T 6495.2-2025 Photovoltaic devices - Part 2.Requirements for photovoltaic reference devices (IEC 60904-1.2023, IDT)

IEC 60904-9 Photovoltaic devices - Part 9. Classification of solar simulator characteristics

NOTE: GB/T 6495.9-2025 Photovoltaic devices - Part 9. Classification of solar simulator characteristics (IEC 60904-9:2020, IDT)

3 Terms and definitions

This document does not contain any terms or definitions that need to be defined.

ISO and IEC maintain terminology databases for use in standardization at the following addresses.

4 Equipment and instruments

The test methods specified in this document require the following equipment and instruments.

a) Solar simulator 1. A solar simulator conforming to IEC 60904-9 for measuring the I-V curve, equipped with a photovoltaic cell temperature testing device with an accuracy of ± 1 °C, and a device for simultaneously measuring photovoltaic cell current and voltage as specified in IEC 60904-1.

b) Environmental test chambers or spaces that meet the following requirements.

1) one or more radiation sensors (compliant with IEC 60904-2) for monitoring cumulative radiation;

2) a device for mounting and testing photovoltaic cells, which is coplanar with the irradiation sensor;

3) a temperature control device for controlling the temperature at (60 ± 5) °C during photoirradiation;

4) relative humidity of $\leq 50\%$;

5) the interior shall be free of pollution and corrosive gases.

c) Solar simulator 2. A steady-state solar simulator of BBB grade (or above) as specified in IEC 60904-9, capable of providing irradiance of (1000 ± 50) W/m² for photovoltaic cells installed in an environmental test chamber.

5 Sample preparation

This experiment requires at least 20 photovoltaic cells. Samples replaced due to mechanical damage or handling damage shall also be tested.

Under normal sampling standards, the photovoltaic cells used in the tests shall be randomly selected from the same sorting box and the same production batch. If a special sampling

method is used, it shall be described in detail in the test report. For ease of tracking and reporting, all test samples shall be individually numbered.

The selected photovoltaic cells shall be stored in a sealed, opaque container immediately after I-V measurement to minimize ambient light exposure.

6.1 Test the initial power of photovoltaic cells under standard test conditions (STC)

according to the method specified in IEC 60904-1. Each photovoltaic cell shall be tested three times. Read the maximum power value from each of the three I-V curves, calculate the average value, and record its power P_n ($n=0, 1, 2, 3, \dots$), respectively. Each test shall be spaced at least 3 seconds apart to allow the photovoltaic cell surface temperature to recover to its initial value. The contact method of the photovoltaic cell shall not be changed throughout the entire test. The repeatability of the three readings shall be better than 0.2%.

6.2 Transfer the photovoltaic cells to an environmental test chamber [satisfying clause

4b)] and expose all photovoltaic cells to a solar simulator 2 with an irradiance of (1000 ± 50) W/m². To compensate for uneven light source distribution, it is recommended to systematically move the photovoltaic cells to different locations within the test chamber between each irradiation cycle. Simultaneously, the surface temperature of the photovoltaic cells shall be controlled at (60 ± 5) °C during the test.

6.3 Once the cumulative irradiance in 6.2 reaches 5 kWh/m², repeat 6.1.

To simplify the entire testing process, an initial irradiance of 5 kWh/m² is recommended instead of 1 kWh/m². The initial irradiance can be adjusted according to the photovoltaic cell technology or testing requirements.

6.4 Repeat 6.2 with each 1 kWh/m² as one light irradiation cycle, and repeat 6.1 after each cycle.

6.5 For each photovoltaic cell, repeat step 6.4 until it reaches the LID quasi-stable state, i.e., satisfies the condition of formula (1).

where

P_{max} , P_{min} , and $P_{average}$ -- calculated values of the power P_{n-2} , P_{n-1} , and P_n measured after three consecutive irradiations.

.....