

---

Draft Jamaican Standard

Specification

for

Photovoltaic devices –

**Part 9: Classification of solar simulator characteristics**

---



**BUREAU OF STANDARDS JAMAICA**

**NON-OBJECTION PERIOD: 12 November 2023 to 11 December 2023**

Draft Jamaican Standard

IMPORTANT NOTICE

Jamaican standards are subjected to periodic review. The next amendment will be sent without charge if you cut along the dotted line and return the self-addressed label. If we do not receive this label we have no record that you wish to be kept up-to-date. Our address:

Bureau of Standards Jamaica  
6 Winchester Road  
P.O. Box 113  
Kingston 10  
Jamaica W.I.

-----([cut along the line])-----

**DJS IEC 60904-9: 2023**

NAME OR DESIGNATION.....

ADDRESS.....

## JBS CERTIFICATION MARK PROGRAMME

The general policies of the JBS Certification Mark Programme are as follows:

- The JBS provides certification services for manufacturers participating in the programme and licensed to use the gazetted JBS Certification Marks to indicate conformity with Jamaican Standards.
- Where feasible, programmes will be developed to meet special requirements of the submitter.
- JBS certification is provided in the interest of maintaining agreed-upon standard requirements. Where applicable, certification may form the basis for acceptance by inspection authorities responsible for enforcement of regulations.
- In performing its functions in accordance with its policies, JBS does not assume or undertake to discharge any responsibility of the manufacturer or any other party.

Participants in the programme should note that in the event of failure to resolve an issue arising from interpretation of requirements, there is a formal appeal procedure.

Further information concerning the details of JBS Certification Mark Programme may be obtained from the Jamaica Bureau of Standards, 6 Winchester Road, Kingston 10.

### CERTIFICATION MARKS



Product Certification Marks



Plant Certification Mark



Certification of Agricultural Produce (CAP) Mark



Jamaica-Made Mark

**Draft Jamaican Standard**  
**Specification**  
**for**  
**Photovoltaic devices –**  
**Part 9: Classification of solar simulator characteristics**

Bureau of Standards  
Jamaica 6 Winchester Road  
P.O. Box 113  
Kingston 10  
Jamaica, W.I.  
Tel: (876) 926 -3140-5, (876) 632-4275 or (876) 618-1534  
Fax: (876) 929 -4736  
Website: [www.bsj.org.jm](http://www.bsj.org.jm)  
E-mail: [info@bsj.org.jm](mailto:info@bsj.org.jm)

Month 202X

©202X Bureau of Standards Jamaica

**All rights reserved. Unless otherwise specified, no part of a Bureau of Standards publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including, photocopying microfilm or scanning without permission in writing.**

**ISBN XXX-XXX-XXX-X**

Declared by the Bureau of Standards Jamaica to be **a standard specification** pursuant to section 7 of the Standards Act 1969.

First published **Month 202X**

This standard specification was circulated in draft form for **thirty (30) days non-objection** under the reference DJS IEC 60904-9: 2023.

Jamaican Standards establish requirements in relation to commodities, processes and practices, but not purport to include all the necessary provisions of a contract.

The attention of those using this standard specification is called to the necessity of complying with any relevant legislation.

#### Amendments

No.	Date of Issue	Remarks	Entered by and date

Contents	Pages
National Foreword.....	iv
Acknowledgement.....	v
Foreword.....	4
<b>1. Scope</b> .....	<b>6</b>
<b>2. Normative references</b> .....	<b>7</b>
<b>3. Terms and definitions</b> .....	<b>7</b>
<b>4. Classification of solar simulator characteristics</b> .....	<b>12</b>
<b>5. Measurement procedures</b> .....	<b>13</b>
<b>6. Name plate and data sheet</b> .....	<b>22</b>
 Annex A (informative) Assessment of spectral mismatch error: Sensitivity to spectral irradiance.....	 24
Bibliography .....	29

## National Foreword

This standard is an adoption and is identical to **ISO IEC 60904-9: 2020** Photovoltaic devices- Part 9: Classification of solar simulator characteristics published by International Electrotechnical Commission (IEC).

### Scope of the Standard

IEC standards for photovoltaic devices require the use of specific classes of solar simulators deemed appropriate for specific tests. Solar simulators can be either used for performance measurements of PV devices or endurance irradiation tests. This part of IEC 60904 provides the definitions of and means for determining simulator classifications at the required irradiance levels used for electrical stabilization and characterisation of PV devices.

This document is applicable for solar simulators used in PV test and calibration laboratories and in manufacturing lines of solar cells and PV modules. The A+ category is primarily intended for calibration laboratories and is not considered necessary for power measurements in PV manufacturing and in qualification testing. Class A+ has been introduced because it allows for reduction in the uncertainty of secondary reference device calibration, which is usually performed in a calibration laboratory. Measurement uncertainty in PV production lines will directly benefit from a lower uncertainty in PV production lines will directly benefit from a lower uncertainty of calibration, because production line measurements are performed using secondary reference devices.

In the case of PV performance measurements, using a solar simulator of a particular class does not eliminate the need to quantify the influence of the simulator on the measurement by making spectral mismatch corrections and analysing the influences of spatial non-uniformity of irradiance in the test plan and temporal stability of irradiance on that measurement. Test reports for PV devices tested with the simulator report the class of simulator used for measurement and the method used to quantify the simulator's effect on the results.

The purpose of this document is to define classifications of solar simulators for use in indoor measurements of terrestrial photovoltaic devices. Solar simulators are classified as A+, A, B or C based on criteria of spectral distribution match, irradiance non-uniformity in the test plane and temporal instability of irradiance. This document provides the required methodologies for determining the classification of solar simulators in each of the categories. A solar simulator which does not meet the minimum requirements of class C cannot be classified according to this document.

For spectral match classification a new procedure has been added. This procedure addresses the actual need for an extended wavelength range, which is arising from advances in solar cell technology (such as increased spectral responsivity below 400 nm) as well as solar simulators technology (use of component LEDs). The procedure of the second edition of this standard is still valid but is only applied if backward compatibility of classification for solar simulators already in use and for solar simulators in production/sale is required. The solar simulator characteristics described in this document are not used in isolation to imply any level of measurement confidence or measurement uncertainty for a solar simulator application (for example, PV module power measurement). Measurement uncertainties in each application depend on many factors, several of which are outside the scope of this document:

- Characteristics of the solar simulator, possibly including characteristics not covered by this document;
- Methods used to calibrate and operate the solar simulator;

- Characteristics of the device(s) under test ( for example, size and spectral responsivity);
- Quantities measured from the device(s) under test, including equipment and methods used for measurement;
- Possible corrections applied to measured quantities.

Where applications require a certain solar simulator characteristic, it is preferable to specify a numerical value rather than a letter classification (for example, “ $\leq 5\%$  non-uniformity of irradiance” rather than “Class B non-uniformity of irradiance”). If not obvious from the application, it should also be indicated how the required simulator characteristic correlates to relevant measured quantities. Since PV module power measurement is one of the most common applications for solar simulators, brief guidance on this application is given in informative notes for each solar simulator characteristic described in this document. This document is used in combination with IEC TR 60904-14, which deals with best practice recommendations for production line measurements of single-junction PV module maximum power output and reporting at standard test conditions. For output power characterization of PV devices, IEC TR 60904-14 addresses the relevance of the letter grades (A+, A, B, C) for measurement uncertainty.

Where the words ‘International Standard’ appear, referring to this standard, they should be read as ‘Jamaican Standard’.

Where reference is made to informative and normative annexes the following definitions should be noted:

- Informative Annex – gives additional information intended to assist in the understanding or use of the document. They do not contain requirements.
- Normative Annex – gives provisions additional to those in the body of a document. They contain requirements.

Users should note that all standards undergo revision from time to time and that any reference made herein to any standard implies its latest edition, unless otherwise stated.

This standard is voluntary.

### **Acknowledgement**

Acknowledgement is made to the International Electrotechnical Commission (IEC) for permission to adopt IEC 60904-9: 2020.