



CSIR PHOTOVOLTAIC (PV) MODULE QUALITY AND RELIABILITY TESTING LABORATORY

Overview

The CSIR's Photovoltaic (PV) Module Quality and Reliability Testing Laboratory, the first of its kind in Africa, boasts world-class equipment designed to conduct performance, safety and reliability stress testing on PV modules. Pre-construction testing ensures that only high-quality modules suited to South Africa's unique climate are developed and installed.

Value proposition

- **World-Class equipment:** Our lab features cutting-edge technology for simulating real-world environmental conditions, ensuring rigorous independent testing and validation of PV modules.
- **ISO 17025 accreditation:** Strict adherence to international standards for laboratory testing and the IEC 61215:2021 standard for PV module design qualification and type approval required for warranty claims. The lab is accredited for fifteen test methods.
- **Expertise and experience:** Experienced in solar PV, our team is equipped to handle various PV technologies and deliver accurate, reliable results.

Unique capabilities

1. Accelerated stress testing:

Stress tests are designed to induce failures typically observed in poorly constructed PV modules, which may take years to observe in the field. Accelerated stress tests are designed to induce the same field failures in a matter of weeks. Pre-construction testing helps to prevent poorly constructed modules from reaching the client's project.

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- **Thermal cycling:** Stresses cell interconnects and solar bonds from thermal expansion and contraction.
- **Humidity freeze testing:** Stresses the module lamination, junction box adhesion and edge adhesion.
- **Damp heat testing:** Stresses the module lamination, junction box adhesion and backsheets.
- **Mechanical load testing:** Stresses cells, cell interconnects and module glass.



areas, corrosion, bypass diode failures and many other defects that can impact power output over time. The CSIR has developed artificial intelligence to identify and quantify the impact of twelve different defects using deep-learning models.

Speed and Agility

- **Quick Turnaround:** Our lab is designed for efficient testing, offering rapid results to accelerate the development and deployment of reliable PV modules.
- **Adaptive Testing Protocols:** We can customise our testing procedures to meet specific client requirements, ensuring agility and responsiveness to the changing needs of the South African climate.

PV Lab Accessibility and Collaboration

- **Strategic Location:** Situated in a prime location for easy access by local and international clients.
- **Collaborative Approach:** We work closely with clients to understand their unique challenges and provide tailored testing solutions.

2. Advanced Characterisation Equipment:

- **Sun Simulator:** The large-area sun simulator provides precise current, voltage and power output measurements over a range of temperature and irradiance levels. The results are used to compare against the module nameplate ratings and to quantify power losses associated with the accelerated stress tests.
- **High Potential Electrical Tester (Hipot):** The Hipot test equipment identifies electrical insulation failures under wet and dry conditions, ensuring long-term safety and performance.
- **Electroluminescence (EL) Imaging:** EL generates an “x-ray like” image of the PV module, which reveals cracks, inactive

Our Competitive Advantage

- **Competitive Pricing:** We offer high-quality testing services at competitive rates, ensuring excellent value for our clients.
- **Cost Efficiency:** Our testing services help clients avoid costly replacements and maintenance in the long run by detecting potential module failures before the modules are installed on the plant.

Thought Leaders in Solar PV Research

The CSIR lab stands out in Africa for its capabilities in accelerated stress testing and the integration of

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advanced AI and machine learning techniques to enhance the accuracy and predictive power of our tests. Our thought leadership in this area is driven by senior experts with specialised skills in the development of automated performance monitoring and fault detection systems, as well as deep learning models for defect detection in PV modules.



KEY PERSONNEL

Lawrence Pratt
**PV Lab lead and CSIR Principal
 Researcher**

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Expertise: Research and development in novel solar cells and module assembly, PV module reliability and certification testing, machine learning, data science and engineering management in semiconductors incl PV.

OUR CUSTOMERS



CONTACT

For more information or to schedule a consultation, please contact:

The CSIR Photovoltaic (PV) Module Quality and Reliability Testing Laboratory
 Lawrence Pratt or Manjunath Basappa Ayanna at
 pvlab@csir.co.za.

Explore the future of reliable and high-performance solar PV solutions with the CSIR PV lab – where innovation meets excellence.

Reasons why you should engage with us today

- **Unmatched Expertise:** Benefit from Lawrence Pratt's extensive experience and our team's comprehensive knowledge of PV technologies.
- **Rigorous Testing:** Ensure your PV modules meet the highest standards of quality and reliability.
- **Innovative Solutions:** Leverage our cutting-edge technology and advanced analytical methods to gain a competitive edge.
- **Trusted Partner:** Rely on our proven track record and collaborative approach to achieve your goals.

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