



Calibration Cert. #

Technology and Application Center
PV Lab

Newport Calibration Cert. #

DUT S/N:

Newport Calibration #:

Manufacturer: Newport Oriel

Material (single junction): m-Si KG5

Measurement Date: 05-Jun-2020

Temperature Sensor: TC-K, DUT Temperature: 24.97 ± 0.58 °CEnvironmental conditions at the time of calibration: Temperature: 24 ± 3 °C; Humidity: 30 ± 20 %

The above DUT has been tested using the following methods to meet the ISO 17025 Standard by the PV Lab at Newport Corporation. Quoted uncertainties are expanded using a coverage factor of $k = 2$ and expressed with an approximately 95% level of confidence. Measurement of total irradiance is traceable to the World Radiometric Reference (WRR) and all other measurements and uncertainties are traceable to NIST and the International System of Units (SI).

Efficiency [%]	5.89 ± 0.10	V _{oc} [V]	0.5930 ± 0.0024	I _{sc} [A]	0.05441 ± 0.00077
P _{max} [mW]	23.57 ± 0.38	V _{max} [V]	0.4845 ± 0.0022	I _{max} [A]	0.04864 ± 0.00069
FF [%]	73.03 ± 0.83	Area [cm ²]	3.9980 ± 0.0044	M	1.0012 ± 0.0040

Methods:I-V: ASTM E948-16 *Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight*QE: ASTM E1021-15 *Standard Test Method for Spectral Responsivity Measurements of Photovoltaic Devices***Standard Reporting Conditions:**

Spectrum: AM1.5-G (ASTM G173-03/IEC 60904-3 ed. 2)

1000.0 W/m² at 25.0°C**Secondary Reference Cell:**

Device S/N: 10510-0054

Device Material: mono-Si

Window Material: fused silica

Certification: National Renewable Energy Laboratory

A2LA accreditation certificate # 2236.01

ISO Tracking #: 2008

Certified short circuit current (I_{sc}) under standard reporting conditions (SRC): 124.70 mA

Calibration due date: 26-Sep-21

Solar Simulator:Spectrum: Newport Corporation filename *Sol3A_Spectroradiometer_Scan_0215.xls*Total irradiance: 1000 W/m² based on I_{sc} of the above Secondary Reference Cell**Quantum Efficiency for DUT:**Newport Corporation filename *QE_2316.log*Spectral mismatch correction factor: $M = 1.0012 \pm 0.0040$ **DUT Calibration Procedures:**

Newport Corporation document W11 (EQE).docx

Newport Corporation document Area Measurement W12 (Area).docx

Newport Corporation document W13 (IV Sweep).docx

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Reviewed and Approved by: Geoffrey Wicks (Geoffrey.Wicks@mksinst.com)		
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