# SUN SAFE LLC • Phase 1 Field Trial Log • v29

Blackout Sheet • Suniva OPT255-60-4-100 • NEC 690 / NFPA 70E • V17 Protocol • Patent Pending

SIDE 1 — RAW FIELD DATA ONLY
Record in real time. All math on Side 2.

**TAPE KEY:** Fluke 393 | Seaward Clamp | DayStar #1 AMB | AH-Sol #1 AMB | Seaward 200R AMB + BOM | DayStar #2 UNDER | AH-Sol #2 UNDER | AUTOOL BT270

## 1 TRIAL IDENTIFICATION — first entry 13:58:06

| [1] TRIAL # | [2] DATE | [3] VIDEO FILE # | [4] TILT | [5] AZIMUTH | [6] SHEET UNIT | [7] SHEET CONDITION |
|---|---|---|---|---|---|---|
| Trial number (any) | Month / day / year | GoPro / phone / glasses file ID | Module tilt by inclinometer | Module facing by compass | Prototype number | OK, or note changes from prior trial |
| 005 (#) | 2026-10-22 | | 34 (°) | 205 (°) | 004 (#) | New |

## 2 CONDITIONS — first entry 14:00:45

*Take Voc BEFORE applying the short • ambient refs >= 800 W/m² before sheet*

| [8] START TIME | [9] END TIME | [10] WIND | [11] MODULES DRY? | [12] Voc BASELINE | [13] DayStar #1 AMB | [14] AH-Sol #1 AMB | [15] Seaward 200R |
|---|---|---|---|---|---|---|---|
| Trial start | Trial end | Max gust — VOID if over 12 | Yes / No | Open-circuit volts, before short & sheet | Ambient watts per meter sq. | Ambient watts per meter sq. | Ambient watts per meter sq. + temperatures |
| 14:00 (HH:MM) | (HH:MM) | 1.4 (m/s) | Yes | 35.4 (V) | 870 (W/m²) | 901 (W/m²) | Cell 39 °C Amb. 19 °C 873 |

## 3 PRE-DEPLOYMENT BASELINE — SHORTED — NO SHEET — first entry 14:02:45

*SC-3: module generating on all instruments*

| [16] FLUKE 393 | [17] SEAWARD CLAMP | [18] DayStar #1 | [19] AH-Sol #1 | [20] Seaward 200R | [21] DayStar #2 | [22] AH-Sol #2 | [23] BT270 |
|---|---|---|---|---|---|---|---|
| Shorted amps | Shorted amps | Ambient watts per meter sq. | Ambient watts per meter sq. | Ambient watts per meter sq. | Module-face watts per meter sq. (before sheet) | Module-face watts per meter sq. (before sheet) | Shorted amps |
| 7.9 (A) | 7.81 (A) | 871 (W/m²) | 902 (W/m²) | 878 (W/m²) | 841 (W/m²) | 903 (W/m²) | 8 (A) |

## 4 POST-DEPLOYMENT — STAGE 1 + STAGE 2 DATA — SHORTED — SHEET DEPLOYED — first entry 14:05:18

*10 s stabilisation — record all simultaneously*

| [24] FLUKE 393 | [25] SEAWARD CLAMP | [26] DayStar #1 | [27] AH-Sol #1 | [28] Seaward 200R | [29] DayStar #2 | [30] AH-Sol #2 | [31] BT270 |
|---|---|---|---|---|---|---|---|
| Shorted amps, sheet deployed | Shorted amps, sheet deployed | Ambient watts per meter sq. | Ambient watts per meter sq. | Ambient watts per meter sq. | Under-sheet watts per meter sq. | Under-sheet watts per meter sq. | Shorted mA, sheet deployed |
| 0.0 (A) | 0.00 (A) | 847 (W/m²) | 890 (W/m²) | 862 (W/m²) | 000 (W/m²) | 2.1 (W/m²) | 11 (mA) |

## 5 DISCONNECT — METER ZERO CHECK + Voc UNDER SHEET — STRING DISCONNECTED — SHEET ON — first entry 14:10:27

*Disconnect, then read clamps (known 0 A) and Voc; sheet stays on until done*

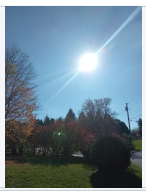
| [32] FLUKE 393 | [33] SEAWARD CLAMP | [34] BT270 | [35] Voc UNDER SHEET | [36] CELL TEMP at Voc | [37] AMBIENT TEMP |
|---|---|---|---|---|---|
| Disconnected, sheet on — known 0 A | Disconnected, sheet on — known 0 A | Disconnected, sheet on — known 0 A | Open-circuit volts, disconnected, sheet on | Back-of-module temp, Seaward 200R | Air temp, Seaward 200R |
| 0.0 (A) | 0.00 (A) | 0 (mA) | 8.1 (V) | 28 (°C) | 18 (°C) |

## 6 FIELD OBSERVATIONS

*Sky, wind, anomalies, VOID reason*

[38]

1 · SKY / SUN 14:02



2 · SHORTED, NO SHEET 14:03



3 · SHORTED, SHEET ON 14:06



## BOARD



## 7 TRIAL CERTIFICATION & SIGN-OFF

*Sign after Side 2 is complete*

I certify the data above was recorded in real time, all instruments were within rated range, video was recorded where noted in [3], and every Side 2 result was calculated from the boxes referenced.

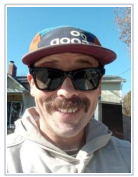
TECHNICIAN SIGNATURE

SUPERVISOR SIGNATURE

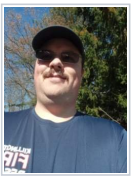
Casey schuyler
TECHNICIAN PRINT

Mark Foote
SUPERVISOR PRINT

2026-10-22
DATE



TECHNICIAN



WITNESS

**OVERALL RESULT**
(copy Side 2 row F)

X PASS | FAIL | VOID

# SUN SAFE LLC • Phase 1 Field Trial Log • v29

SIDE 2 — CALCULATION WORKSHEET • work top to bottom • every result traces to a Side-1 box [##]

Sandia SAND2004-3535 • Beer-Lambert
Mavromatakis et al. NREL 2017 • V17 Protocol

**MODULE ELECTRICAL DATA — values used in every formula below (Isc, Voc from test-unit nameplate • B = datasheet -0.335 %/°C × 38.0 V)**

| MODEL | PMAX | ISC (STC) | VOC (STC) | CELLS IN SERIES | VOC TEMP COEFF B | DIODE IDEALITY N | KT/Q AT 25°C | STC |
|---|---|---|---|---|---|---|---|---|
| Suniva OPT255-60-4-100 | 255 W | 8.71 A = 8710 mA | 38.0 V | 60 | -0.127 V/°C | 1.0 | 0.025693 V | 1000 W/m², 25°C |

| # | CHECK — WHAT AND WHY | FORMULA (box refs) | SHOW WORK | RESULT | CRITERION | PASS / FAIL |
|---|---|---|---|---|---|---|
| **1** | **WAS THE SUN STRONG ENOUGH? (any FAIL = VOID the trial, not a failed trial)**<br>WHY: 800 W/m² is the NOCT test irradiance — the industry's standard "real operating sun" condition | | | | | |
| 1a | **DayStar #1 — ambient**<br>*Primary ambient reference* | [26] | [26] = 847 W/m² | **847 W/m²** | >= 800 W/m² | PASS |
| 1b | **AH-Sol #1 — ambient**<br>*Second ambient reference, different technology* | [27] | [27] = 890 W/m² | **890 W/m²** | >= 800 W/m² | PASS |
| **2** | **DID THE CURRENT COLLAPSE? (Stage 1 safety gate — each clamp on its own)**<br>WHY: 125 mA = field measurement-noise floor (0.10 A noise, 0.11 A passes, 0.13 A fails) • 40 mA = NFPA 70E-2027 FD 390.2(2) dc shock threshold | | | | | |
| 2a | **Fluke 393 — sheet deployed**<br>*Well-zeroed Fluke reads 0–100 mA at true zero. If [24] <= its zero reading [32], that is meter floor, not current* | [24] vs [32] | [24] = 0 A × 1000 = 0 mA<br>[32] = 0 mA | **0 mA** | < 125 mA or <= [32] | PASS |
| 2b | **Seaward Clamp — sheet deployed**<br>*Second make, independent of Fluke. Convert A to mA (× 1000)* | [25] | [25] = 0 A × 1000 = 0 mA | **0 mA** | < 125 mA | PASS |
| 2c | **BT270 — sheet deployed**<br>*Authoritative clamp — 1 mA resolution* | [31] | [31] = 11 mA | **11 mA** | < 125 mA | PASS |
| 2c-2 | **BT270 — NFPA 70E (< 40 mA)**<br>*NFPA 70E-2027 FD 390.2(2): dc shock = 100 V and 40 mA* | [31] | [31] = 11 mA | **11 mA** | < 40 mA (record — not in S1) | PASS |
| 2d | **Meter zero check (open string)**<br>*No current can flow — each meter's true zero. A well-zeroed Fluke reads 0–100 mA; 200 mA means a zeroing error.* | [32] [33] [34] | [32] = 0 A × 1000 = 0 mA<br>[33] = 0 A × 1000 = 0 mA<br>[34] = 0 mA | **max 0 mA** | each < 125 mA (Fluke 200 = re-zero) | PASS |
| **S1** | **STAGE 1 RESULT — PASS ONLY IF 2A, 2B AND 2C ALL PASS** | | | | **ALL 3 PASS** | PASS |
| **3** | **DID THE LIGHT DROP? (Stage 2 — each meter on its own)**<br>WHY: 7 W/m² keeps even a 14 A module under 125 mA (98 mA) • OD 2.3 = 7 ÷ 1400 W/m² design-basis sun | | | | | |
| 3a | **DayStar #2 — under sheet**<br>*Primary optical reading at the module face* | [29] | [29] = 0 W/m² | **0 W/m²** | < 7 W/m² | PASS |
| 3b | **AH-Sol #2 — under sheet**<br>*Second optical technology* | [30] | [30] = 2.1 W/m² | **2.1 W/m²** | < 7 W/m² | PASS |
| 3c | **Optical density (OD)**<br>*How much light the sheet blocks, on a log scale. If [29] reads 0, use 1 and write OD as ">="* | R = [29] ÷ [26]<br>OD = -log10(R) | [29] 0 -> 1 W/m² ÷ [26] 847 W/m²<br>R = 0.00118<br>OD = >= 2.93 | **OD >= 2.93** | >= 2.3 (target 2.5) | PASS |
| **S2** | **STAGE 2 RESULT — PASS ONLY IF 3A, 3B AND 3C ALL PASS** | | | | **ALL 3 PASS** | PASS |
| **4** | **DOES THE CURRENT AGREE WITH THE LIGHT? (Stage 3 — cross-check)**<br>WHY: current rises in step with light (Sandia), so two independent paths must give the same light level | | | | | |
| 4a | **Light from current**<br>*Current tracks light (Sandia). 8710 mA = this module's nameplate Isc. × 1000 = STC 1000 W/m².* | [31] × 1000 ÷ 8710 | [31] = 11 mA × 1000 ÷ 8710 = 1.263 W/m² | **1.263 W/m²** | record | *record only* |
| 4b | **Agreement with DayStar #2**<br>*Absolute gap between 4a and the meter. Tolerance = larger of 2.0 W/m² or 30% of [29]* | \|4a - [29]\| <= tolerance | \|1.263 - 0\| = 1.263 W/m²<br>tolerance = 2 W/m² | **gap 1.26 W/m²** | gap <= tolerance | PASS |
| **S3** | **STAGE 3 RESULT — PASS IF 4B PASS** | | | | **4B PASS** | PASS |
| **5** | **HOW MUCH DID THE VOLTAGE DROP? (record only — spec S23)**<br>WHY: Voc falls only ~3.5 V per 10× less light, then drops sharply in very low light (shunt losses) — proof of effect, not a safety pass | | | | | |
| 5a | **Voc SUPPRESSION**<br>*Voltage falls when light is blocked — independent electrical proof the sheet works* | R = [35] ÷ [12]<br>(1 - R) × 100 | [35] 8.1 V ÷ [12] 35.4 V<br>R = 0.2288<br>Supp. = 77.1 % | **77.1 %** | % — record | *record only* |

## F OVERALL TRIAL RESULT

PASS = S1 + S2 + S3 all PASS • VOID = any ambient FAIL or protocol void condition (reason in [38]) • copy to Side 1

**X PASS** | FAIL | VOID

**1 · SKY / SUN — CONDITIONS** taken 14:02



**2 · INSTRUMENTS — MODULE SHORTED, NO SHEET** taken 14:03




**3 · INSTRUMENTS — MODULE SHORTED, SHEET ON** taken 14:06




## 6 FIELD OBSERVATIONS — FULL TEXT [38]

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