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 14:16:02

[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
006 (#)	2026-10-22		34 (°)	205 (°)	004 (#)	New

2 CONDITIONS — first entry 14:16:37

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
14:16 (HH:MM)	14:25 (HH:MM)	0.0 (m/s)	Yes	35.9 (V)	836 (W/m²)	885 (W/m²)	Cell 35 °C Amb. 19 °C 843

3 PRE-DEPLOYMENT BASELINE — SHORTED — NO SHEET — first entry 14:18:32

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
7.8 (A)	7.63 (A)	846 (W/m²)	896 (W/m²)	864 (W/m²)	819 (W/m²)	884 (W/m²)	7.7 (A)

4 POST-DEPLOYMENT — STAGE 1 + STAGE 2 DATA — SHORTED — SHEET DEPLOYED — first entry 14:22:03

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)	816 (W/m²)	869 (W/m²)	832 (W/m²)	000 (W/m²)	1.3 (W/m²)	8 (mA)

5 DISCONNECT — METER ZERO CHECK + Voc UNDER SHEET — STRING DISCONNECTED — SHEET ON — first entry 14:22:31

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

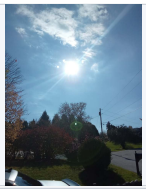
[32] FLUKE 393	[33] SEAWARD CLAMP	[34] BT270	[35] Voc UNDER SHEET	[36] CELL TEMP at Voc	[37] AMBIENT TEMP
Disconnected, sheet on — known 0 A	Disconnected, sheet on — known 0 A	Disconnected, sheet on — known 0 A	Open-circuit volts, disconnected, sheet on	Back-of-module temp, Seaward 200R	Air temp, Seaward 200R
0.0 (A)	0.00 (A)	4 (mA)	7.8 (V)	33 (°C)	18 (°C)

6 FIELD OBSERVATIONS

Sky, wind, anomalies, VOID reason

[38]

1 · SKY / SUN 14:18



2 · SHORTED, NO SHEET 14:20



3 · SHORTED, SHEET ON 14:23



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.

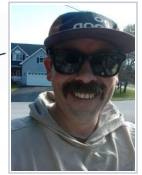
TECHNICIAN SIGNATURE

SUPERVISOR SIGNATURE

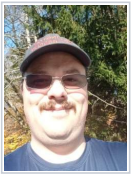
Casey schuyler
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Mark Foote
SUPERVISOR PRINT

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)** WHY: 800 W/m² is the NOCT test irradiance — the industry's standard "real operating sun" condition					
1a	**DayStar #1 — ambient** *Primary ambient reference*	[26]	[26] = 816 W/m²	**816 W/m²**	>= 800 W/m²	PASS
1b	**AH-Sol #1 — ambient** *Second ambient reference, different technology*	[27]	[27] = 869 W/m²	**869 W/m²**	>= 800 W/m²	PASS
2	**DID THE CURRENT COLLAPSE? (Stage 1 safety gate — each clamp on its own)** 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** *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 [32] = 0 mA	**0 mA**	< 125 mA or <= [32]	PASS
2b	**Seaward Clamp — sheet deployed** *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** *Authoritative clamp — 1 mA resolution*	[31]	[31] = 8 mA	**8 mA**	< 125 mA	PASS
2c-2	**BT270 — NFPA 70E (< 40 mA)** *NFPA 70E-2027 FD 390.2(2): dc shock = 100 V and 40 mA*	[31]	[31] = 8 mA	**8 mA**	< 40 mA (record — not in S1)	PASS
2d	**Meter zero check (open string)** *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 [33] = 0 A × 1000 = 0 mA [34] = 4 mA	**max 4 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)** 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** *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** *Second optical technology*	[30]	[30] = 1.3 W/m²	**1.3 W/m²**	< 7 W/m²	PASS
3c	**Optical density (OD)** *How much light the sheet blocks, on a log scale. If [29] reads 0, use 1 and write OD as ">="*	R = [29] ÷ [26] OD = -log10(R)	[29] 0 -> 1 W/m² ÷ [26] 816 W/m² R = 0.00123 OD = >= 2.91	**OD >= 2.91**	>= 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)** WHY: current rises in step with light (Sandia), so two independent paths must give the same light level					
4a	**Light from current** *Current tracks light (Sandia). 8710 mA = this module's nameplate Isc. × 1000 = STC 1000 W/m².*	[31] × 1000 ÷ 8710	[31] = 8 mA × 1000 ÷ 8710 = 0.918 W/m²	**0.918 W/m²**	record	*record only*
4b	**Agreement with DayStar #2** *Absolute gap between 4a and the meter. Tolerance = larger of 2.0 W/m² or 30% of [29]*	|4a - [29]| <= tolerance	|0.918 - 0| = 0.918 W/m² tolerance = 2 W/m²	**gap 0.92 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)** 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** *Voltage falls when light is blocked — independent electrical proof the sheet works*	R = [35] ÷ [12] (1 - R) × 100	[35] 7.8 V ÷ [12] 35.9 V R = 0.2173 Supp. = 78.3 %	**78.3 %**	% — 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 14:18



2 · INSTRUMENTS — MODULE SHORTED, NO SHEET taken 14:20



3 · INSTRUMENTS — MODULE SHORTED, SHEET ON taken 14:23



6 FIELD OBSERVATIONS — FULL TEXT [38]

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