

Welcome!

NLR Pyrheliometer Comparisons 2026

NPC-2026

28 September – 9 October



NPC-2024 participants
by Greg Cooper

Welcome to the 26th NLR Pyrheliometer Comparisons NPC-2026

28 September – 9 October 2026
Solar Radiation Research Laboratory
Golden, Colorado

The purpose of NPCs <https://aim.nlr.gov/npc.html> is to provide participants with current World Radiometric Reference (WRR) reduction factors for their absolute cavity radiometers and other reference pyrheliometers based on results from the 14th International Pyrheliometer Comparisons (IPC-XIV) conducted 22 September – 10 October 2025 at the Physikalisch-Meteorologisches Observatorium Davos/World Radiation Center (PMOD/WRC). Information about IPC-XIV is available from : <http://www.pmodwrc.ch>

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SRRL Staff

NLR Metrology Laboratory & Sensing and Predictive Analytics (SePA) group

Afshin Andreas	NLR Cavity Operations, NPC data processing, Computer Issues
Aron Habte	General Assistance, Equipment Loan Agreements
Shawn Jaker	Electrical Power, Tools, Electronics and Hardware, NLR Cavity Operations, Solar trackers, Computer Issues
Berkley Weyer	Electrical Power, Tools, NLR Cavity Operations
Lauren Moloney	Host (Security, Logistics, Food)
Heather Markham	Host (Security, Logistics, Food)
Ibrahim Reda	NPC Data review, General Cavity Assistance

SRRL Location

Solar Radiation Research Laboratory (SRRL)

Latitude:	39.7423 N
Longitude:	105.1785 W
Elevation:	1828.8 m AMSL
Mean Station Pressure:	820 mBar
Time Zone:	(GMT – 7.0)
Phone:	303-384-6326
Emergency Phone:	1234 (on-site)

Telephone Numbers:

EMERGENCY = 303-384-6811
Or
1 2 3 4 (From **any** NLR Desk Phone)

SRRL = 303-384-6326

Safety

Emergency Phone: **RED BOX UNDER INSTRUMENT DECK**
OR Press 1 2 3 4 from any NLR extension

Evacuation Assembly Area: Northeast Corner of Parking Area

Security

Phone: 303-384-6811 or Press 6811 from any NLR extension

NLR *Visitor Badges* issued on first day of NPC at the Visitor Center.
Please wear your badge at all times at SRRL.

Communications

Local (Long Distance): **9** – (1) Area Code – Number

Internet Access:

The Wi-Fi Network is called **NLR-Guest**. The new system does not require a user ID and password for access. Users, including visitors and partners, **will only need to accept the terms** of the acceptable use policy to gain access. The acceptable use policy will be presented each time your mobile device has been away from NLR for several days.

Food & Beverages

Non-alcoholic Beverages and snacks provided.

Lunch (pizza) will be provided on one day during the **first week**.

Equipment Storage

Please use **designated areas** in SRRL staging areas (Page 8).

Dinner on Wednesday (September 30th)

Please join us for the NPC Dinner!

Dinner will be at **Outback Steakhouse**.

Boisterous Australian-themed chain serving steaks, seafood & other hearty steakhouse fare.

Located in: **Denver West Village**

Address: 14295 W Colfax Ave, Lakewood, CO 80401

Website: <https://www.outback.com/>

Menu: <https://www.outback.com/menu/denver-west/>

We will meet for dinner around 6:00 PM.

NPC Schedule and Protocol Summary

1. Schedule

DAY # 1 Monday September 28th

- a. Visitor check-in at NLR Visitor Center, 15013 Denver West Parkway, Golden, CO 80401.
Please plan to arrive at NLR between 07:00 and 08:00 MDT.
- b. Drive to SRRL – Call 303-384-6326 and stay on the phone till the gate opens remotely.
- c. 08:30 MDT - Equipment Installation & tests:
Dry Weather - See the **outdoor seating diagram** below for your workstation.
Wet Weather – Assemble and bench test your equipment inside SRRL.
Locate your equipment and review seating charts
- d. Review of NPC Protocol
- e. Review measurement protocol and procedures.
- f. 10:00 to Sunset - Practice and/or NPC measurements (weather permitting)

DAYS #2-12: 29 September through 09 October (Daily, including the weekend):

- a. Clear sky = Take Measurements!
 - Arrive at SRRL by 07:00 MDT
 - Equipment warm-up for at least 30-minutes
 - First Cavity Calibration at 07:55 MDT
 - Begin comparison "Runs" by 08:00 MDT (07:00 MST)
 - Continue measurements until sundown or the clouds interfere.
- b. Cloudy sky = No Measurements, but optionally...
 - Review of previous day's data analyses
 - Technical Briefings on Radiometry, Measurement Network Operations, etc.
 - Equipment Test
 - Office Time (wireless available)
- c. We will determine the need for continued measurements at the end of each day.

IMPORTANT NOTICE: For those arriving early on the weekend (Sept 26 or 27) you will be receiving a temporary badge. **You must check-in again at the NLR Visitor Center** to receive an official badge on Monday September 28.

Foreign Nationals must check-in at NLR Visitor Center everyday and MUST be escorted to SRRL.

2. Time Keeping

- All time records will be Mountain Standard Time (MST)**
- Outdoor time display with automated loudspeaker announcements will be available.
- We need to keep all PC clocks in agreement to better than 1 second.
- Set your system clock at the daily start-up** or as often as needed to keep 1-second accuracy. Check personal computer clocks during the day.

3. Minimum Data Set

Our goal for a minimum data set for these comparisons is to measure irradiance during three different days (all day or portion). Historically, we have acquired more 2,000 data values for each participating cavity radiometer. At least 300 data values are needed to provide a valid transfer of the WRR to the participating radiometers.

4. Measurements

- Do **NOT** apply any previous **WRR** correction factors to your measurements.
- Use **only** the **factory calibration factor** to adjust your data. As in the past, we will use the following terms:
 - "Calibrate" = Perform electrical calibration and wait for next measurement period to begin
 - "Read" = A measurement of direct irradiance within 1 sec of announcement at 30-sec intervals.
 - "Run" = Collection of 49 readings taken in sequence (also called a *Series*).

The *Timekeeper* will make the following announcements for each Run:

Next Run Begins at HH:MM (MST) [HH:MM (MDT)]
T minus 6 minutes. BEGIN CALIBRATION
T minus 1 minute
T minus 10 sec
T minus 9 - 8 - 7 - 6 - 5 - 4 - 3 - 2 - 1 - READ!

Continue measurements at 30 sec intervals until 49 readings have completed a "Run"

6. Data Transfer

The following standard data format will be used by each participant to be accepted by our new data processing software; Link: https://aim.nlr.gov/Calibrations/NPC/data_format.pdf

After the last daily RUN, and **before** equipment tear-down, email your data file to afshin.andreas@nlr.gov and ibrahim.reda@nlr.gov. Cavity calibration files are not needed.

7. Data Processing

- Described in each NPC published/distributed report. Prior reports are available from <https://aim.nlr.gov/npc.html>

8. Data Reporting

-Our goal is to provide each participant with results next day:
<https://aim.nlr.gov/npcprelim>

-A final report will be published by NLR within two months of the comparisons.

9. Equipment Storage

-Each participant will be given space to store systems at SRRL (see page 8).
-Please let us know if you wish to have any electronics connected to AC power while in storage.

10. Courtesies

-Please get permission before touching someone else's equipment (turning off power strips, adjusting trackers, etc.) to prevent inadvertent data loss.
-Please return borrowed tools to owner.

NLR Pyrheliometer Comparisons NPC-2026

Outdoor Seating Diagram

Tracker Info
Organizational Name
Participant Names

Prede (participant provided)	EKO (participant provided)
Japan Meteorological Agency (JMA) / Prede	EKO Instruments
Nozomu Ohkawara	Akihito Akiyama
Kenichi Kawashima	Wayne Burnett
Yoshiaki Watanabe	

Bench # 1: Breaker # 9

2AP (NLR provided)	SOLYS-GD (NLR provided)
	King Abdullah City for Atomic and Renewable Energy (K.A.CARE)
	Abdullah Kalantan

Bench # 2: Breaker # 7

Brusag (ARM provided)	Tracker on pole --->
DOE Atmospheric Radiation Measurement (ARM) Program	PMOD/WRC
James Martin	Ricco Soder
James Stow	

Bench # 3: Breaker # 2

Brusag (ARM prov.)
PMOD/WRC

Eppley (participant provided)	Eppley (participant provided)
NOAA	Eppley Laboratory
Emiel Hall	Tom Kirk
Logan Soldo	Donald Nelson
Benjamin Sheffer	
Mark Kutchenreiter	
Hagen Telg	

Bench # 4: Breaker # 11

Eppley (participant provided)	EKO (participant provided)
Analytical Mechanics Associates (AMA) / NASA Langley	Atlas Material Testing Technology
Frederick Denn	Major McGee
Bryan Fabbri	Philip Alexander

Bench # 5: Breaker # 3

EKO (participant provided)	SOLYS2 (participant provided)
Campbell Scientific Inc.	Kipp & Zonen
Tristan Worley	Victor Cassella
Ajay Singh	Damon Nitzel
	Benjamin Todt

Bench # 6: Breaker # 6

SOLYS2 (NLR provided)	EKO (participant provided)
University of Oregon (extra space for 1 ACR)	ISO-Cal North America
Josh Peterson	Erik Naranen
Richard Kessler	Ronald Naranen
East Patio (on poles): Breaker # MLP2 - 33 & 35	

EKO (NLR provided)
National Laboratory of the Rockies (NLR)
Ibrahim Reda
Afshin Andreas
Shawn Jaker
Berkley Weyer
Breaker #1

(participant provided)	(participant provided)	(participant provided)
Table Top Breaker # 5		

EKO (participant provided)
Sandia National Laboratories (SNL) - Mobile Cart
Charles Robinson
Inside Outlet (Room 108)

SRRL Instrument Platform (Longwave or other)			
Japan Meteorological Agency (JMA) / Prede	PMOD DWD	ICREA	The Libyan Center for Solar Energy Research and Studies
Nozomu Ohkawara	Ricco Soder	Rafael Avila	Akram Essnid
Kenichi Kawashima	Stefan Wacker		
Yoshiaki Watanabe			
Platform Outlet			

NPC-2026 Indoor Storage Areas

Organization List with Equipment	# Participants	Space
Analytical Mechanics Associates (AMA) / NASA Langley	2	108
Atmospheric Radiation Measurement (ARM)	2	108
Sandia National Laboratories	1	108
University of Oregon, Vignola Solar Monitoring Lab	2	108
National Oceanic and Atmospheric Administration (NOAA)	5	109
National Laboratory of the Rockies (NLR)	n/a	109
Campbell Scientific Inc.	2	121-00
ISO Cal North America	2	121-01
PMOD/WRC	1	125-01
ICREA	1	125-02
The Libyan Center for Solar Energy Research & Studies	1	125-02
Atlas Materials Testing Technology LLC	1	126-01
Kipp & Zonen	3	126-01
Japan Meteorological Agency (JMA) and Prede Co., Ltd.	3	126-04
EKO Instruments	2	126-04
King Abdullah City for Atomic and Renewable Energy	1	126-05

NPC-2026 Participant Contact Information

Organization	Full Name	E-Mail
Analytical Mechanics Associates (AMA) / NASA Langley	Bryan Fabbri	bryan.e.fabbri@nasa.gov
Analytical Mechanics Associates (AMA) / NASA Langley	Fred Denn	frederick.m.denn@nasa.gov
ATLAS Material Testing Technology LLC	Major McGee	major.mcgee@ametek.com
ATLAS Material Testing Technology LLC	Philip Alexander	philip.alexander@ametek.com
Atmospheric Radiation Measurement (ARM)	James Martin	jmartin@ops.sgp.arm.gov
Atmospheric Radiation Measurement (ARM)	James Stow	jstow@ops.sgp.arm.gov
Campbell Scientific Inc	Ajay Singh	asingh@campbellsci.com
Campbell Scientific Inc	Tristan Worley	tworley@campbellsci.com
CIRES - University of Colorado Boulder	Laura Riihimaki	laura.riihimaki@colorado.edu
EKO Instruments	Akihito Akiyama	akiyama@eko.co.jp
EKO Instruments USA Inc	Wayne Burnett	burnett@eko-instruments.com
Eppley Lab	Tom Kirk	tomkirk@eppleylab.com
German Weather Service (DWD)	Stefan Wacker	stefan.wacker@dwd.de
Gigahertz-Optik	Dante Nava	d.nava@gigahertz-optik.com
ICREA	Rafael Avila	gerencia@ingenieriacreativa.com.co
ISO-Cal North America	Erik Naranen	enaranen@isocalnorthamerica.com
ISO-Cal North America	Ronald Naranen	
Japan Meteorological Agency (JMA)	Nozomu Ohkawara	ohkawara@mri-jma.go.jp
King Abdullah City for Atomic and Renewable Energy	Abdullah Kalantan	a.kalantan@energy.gov.sa
Kipp & Zonen	Benjamin Todt	benjamin.todt@kippzonen.com
Kipp & Zonen	Damon Nitzel	damon.nitzel@kippzonen.com
Kipp & Zonen	Victor Cassella	vc@kippzonen.com
NOAA	Emiel Hall	emiel.hall@noaa.gov
NOAA	Logan Soldo	logan.soldo@noaa.gov
NOAA/CIRES	Benjamin Sheffer	ben.sheffer@noaa.gov
NOAA/CIRES	Hagen Telg	hagen.telg@noaa.gov
NOAA/CIRES	Mark Kutchenreiter	mark.kutchenreiter@noaa.gov
NOAA (retired)	Donald Nelson	donaldnelson@mac.com
NSF NCAR Earth Observing Laboratory	Sebastian Hoch	hoch@ucar.edu
PMOD/WRC	Ricco Soder	ricco.soder@pmodwrc.ch
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Prede Co., Ltd.	Yoshiaki Watanabe	ywatanabe@prede.com
Sandia National Laboratories	Charles Robinson	cdrobin@sandia.gov
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Solar Resource Solutions LLC	Tom Stoffel	tstoffelsrs@gmail.com
The Libyan Center for Solar Energy Research and Studies	Akram Essnid	sneeda74@yahoo.com
University of Oregon, Vignola Solar Monitoring	Josh Peterson	jpeters4@uoregon.edu
University of Oregon, Vignola Solar Monitoring	Richard Kessler	rkessler@uoregon.edu