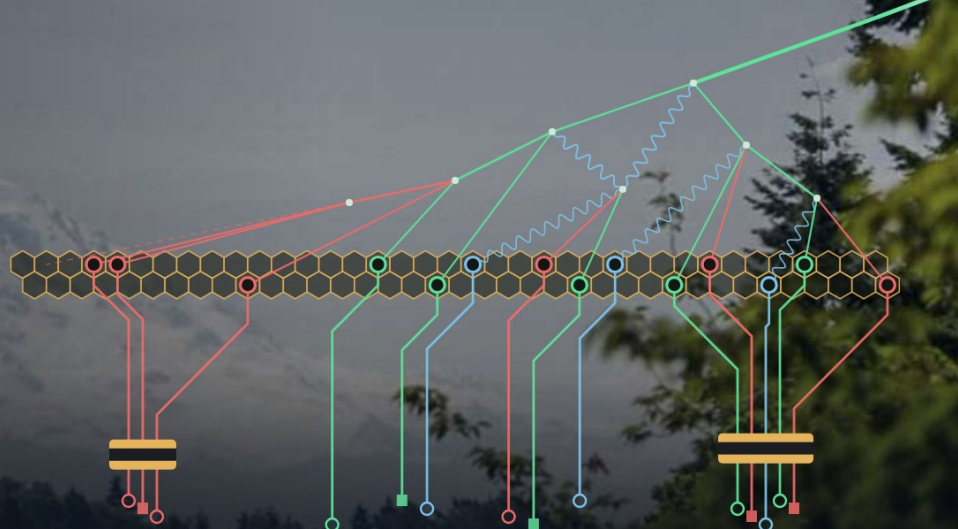


COORDINATING PANEL ON ADVANCED DETECTORS · APS DPF

CPAD 2026

Instrumentation and detector R&D workshop

20–23 October 2026 University of Washington · Seattle, WA



CPAD Introductions and Updates

Jonathan Asaadi
University of Texas at Arlington

Who is CPAD?

- **Two co-chairs**

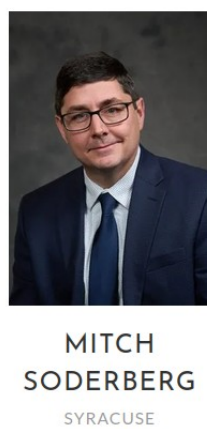
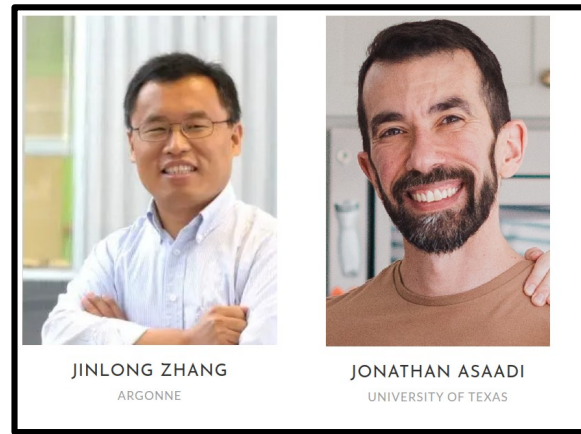
- Jonathan Asaadi (UT Arlington)
 - This will be my last year serving in this role as we welcome a new co-chair (Mitch Soderberg, Syracuse) starting 2027
- Jinlong Zhang (Argonne)

- **Executive Committee**

- Each committee member serves for 2 years with $\sim 1/2$ cycling off every year
- Next years EC to be announced shortly

- **R&D Collaboration (RDC) Coordinators**

- Listed on the next slide



NURAL
AKCHURIN
TEXAS TECH
UNIVERSITY



MICHALIS
BACHTIS
UCLA
TDAQ



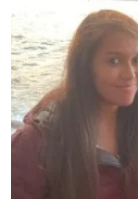
ERIC DAHL
NORTHWESTERN
DARK MATTER



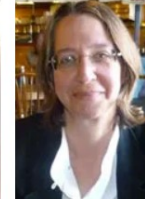
PRAKHAR
GARG
YALE
GASEOUS DETECTORS



SILVIA
ZORZETTI
FNAL
QUANTUM SENSORS



PRASHANSA
MUKIM
BNL
ELECTRONICS



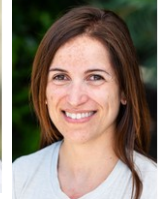
SALLY SEIDEL
UNIVERSITY OF NEW
MEXICO
SILICON DETECTORS,
RADIATION DAMAGE



MITCH
SODERBERG
SYRACUSE
NEUTRINOS



RITOBAN
BASU THAKUR
CALTECH
DARK MATTER AND
CMB



LAURA DI
VACRI
PNNL
LOW BACKGROUND

Who are the RDC's?

- RDC's are organized by technology areas and are supported by two RDC coordinators
- In 2026 we began the process of cycling the leadership of the RDC's and welcomed 6 new coordinators
 - We will continue this process in 2027, so if you are interested in potentially serving in this role, please reach out

RDC	Topic	Coordinators
1	Noble Element Detectors	Jonathan Asaadi, Carmen Carmona
2	Photodetectors	Shiva Abbaszadeh, Flavio Cavanna
3	Solid State Tracking	Sally Seidel, Douglas Berry
4	Readout and ASICs	Lorenzo Rota, Mitch Newcomer
5	Trigger and DAQ	Alexander Paramonov , Zeynep Demiragli
6	Gaseous Detectors	Bob Azmoun , Sven Vahsen
7	Low-Background Detectors (incl. CCDs)	Daniel Baxter, Luara di Vacri
8	Quantum and superconducting Detectors	Caleb Fink , Rakshya Khatiwada
9	Calorimetry	Marina Artuso, Minfang Yeh
10	Detector Mechanics	Andy Jung, Eric Anderssen
11	Fast Timing	Roger Rusack , Matt Wetstein

What do the RDC's do?

- **This continues to be an evolving topic where we are working to find how this organization can best function...**
 - within the US Instrumentation community
 - in collaboration with the international community (e.g. the CERN based DRDs)
 - in the technology and topic area (e.g. an RDC might look different for the noble element community than in the quantum sensor community)
 - within the fast changing, uncertain, and limited funding landscape
- **All this is to say that I don't think we have the final form of what the RDC's can be, but we are interested in actively working with the community to find what can work**
 - Part of what helps us every year is this workshop and gathering thoughts and feedback

What we hope the RDC's can do

Long Term Goal

- **Establish collaborations** which can link together facilities, expertise, people, and experience to tackle technology challenges across HEP/NP
 - This work has started and can be seen within the RDC's themselves as well as the links between many RDC's and CERN DRDs
- **Facilitate new funding mechanisms** for R&D related to a specific technology area which will take place as part of the collaborations' activities
 - The 2026 NOFO included Multi-institutional team applications for HEP Detector R&D
 - CPAD and the RDC's have been involved in helping coordinate responses to funding calls (e.g. Quantum, Microelectronics, Comparative review, etc)
- Work with the CPAD executive committee, ECFA DRDs, and the broader R&D community to **foster a collaborative, supportive, and coordinated environment for new ideas, blue sky efforts, and non-project specific R&D**

CPAD Activities in 2026

- **Annual Award Committees**

- **DPF Instrumentation Award:** The awards honor exceptional contributions to instrumentation advancing the field of particle physics through the invention, refinement, or application of instrumentation and detectors.
 - Instrumentation Award and Instrumentation Early Career Award
 - Awards announced Friday with presentations from the awardees
- **Graduate Instrumentation Award:** The GIRA program aims to encourage and facilitate greater involvement of physics graduate students in significant instrumentation development, to boost recognition of instrumentation work as a vital part of PhD training, and foster the growth of future HEP instrumentation experts in the US.
 - Awards will be announced shortly
 - Due to unexpected circumstances, the award announcement was delayed, so we will host a special meeting to have the awardees give an presentation

CPAD Activities in 2026

- **In 2025 CPAD RDCs undertook a “mini-Basic Research Needs” (BRN) process.**
 - The idea here was to have each RDC articulate the R&D priorities with the associated community, produce a list of handful priorities in a consistent format. Cross-RDC priorities are identified and listed separately.
 - CPAD Publishes a document combining all RDC priorities which is available to the community and posted online to provide a citable reference to be used in funding proposals.
 - [Link to the document](#)
- **In 2026 the RDC’s were asked to update these as required**
 - This can become an ongoing and living document as the research landscape continues to evolve and change
 - An example I’d like to put forward to the community is where do the wants and needs of Artificial Intelligence as they relate to the instrumentation community live
 - I think a document like this could help express to the agencies the communities current thinking and articulate opportunities which we see in the coming year
 - Given how fast the world of AI is changing, having a “living document” may be the best approach

CPAD Mini-BRN

Coordinating Panel for Advanced Detectors

RDC R&D Priorities **CPAD 2025**

Contacts: Jonathan Asaadi (CPAD vice-Chair), Jinlong Zhang (CPAD Chair)

RDC1: Noble Element Detectors

- **RDC1-WP1: Enhance and combine existing readout modalities**

New ideas in charge detection (e.g. pixels, extreme low threshold detection, charge gain, ion detection); new ideas in light detection (e.g. new technologies, geometries, materials, wavelength shifting).

- **RDC1-WP2: New modalities for signal detection**

Going beyond the current paradigm just collecting electrons and photons (e.g. meta-stable fluids, micron-scale tracking, combined multimodal sensors); enhancement in the electronics and readout of the detectors (e.g. photonic readout solutions, new/enhanced architectures at the front-end, artificial intelligence/machine learning inside the detector).

- **RDC1-WP3: Challenges in scaling technologies**

Scaling of purification, radiopurity, doping, high voltage, and other target challenges (e.g. large-scale purification, removing radioactive contaminants).

Making this document the most useful version of itself for those writing proposals as well as useful for communicating the instrumentation communities priorities is the goal going forward

Cross-RDCs Topics

- **cRDCs-WP1: Intelligence in the front-end electronics**

Integration of artificial intelligence / machine learning (AI/ML) algorithms for on-chip triggering and/or data-reduction capabilities. Technologies include smart pixel technology, embedded Field Programmable Gate Arrays (eFPGA), anomaly detection systems, and unconventional computing methods. [RDC1, RDC3, RDC4, RDC5, RDC6, RDC9]

- **cRDCs-WP2: Timing distribution with picosecond synchronization**

Precision timing protocols and distribution systems enabling sub-picosecond synchronization over large-scale detector networks for TDAQ applications (1 ps over 1 km). [RDC3, RDC4, RDC5, RDC6, RDC9, RDC11]

- **cRDCs-WP3: Monolithic Active Pixel Sensors**

Novel Monolithic Active Pixel Sensors (MAPS) with a focus on improving timing (few ns and below) and spatial resolution (sub-10um). This includes exploring novel materials and technologies (CMOS and beyond) and novel readout approaches. [RDC3, RDC4, RDC9]

CPAD Activities in 2026

- **CPAD has been trying to stay engaged in the larger community and making sure we hear (and are heard) from major projects (e.g. DUNE, FCC, EIC)**
 - Example talk given at the FCC meeting at SLAC
- **We also try to engage with the broader particle physics community giving talks at DPF where we try to advocate for the needs of the instrumentation community**
 - Example talk given at the DPF Community Meeting

CPAD efforts and FCC detectors needs

Jonathan Asaadi



51/1-102 - Kavli Auditorium, SLAC

09:25 - 09:45

4:00 PM

CPAD

🕒 15m

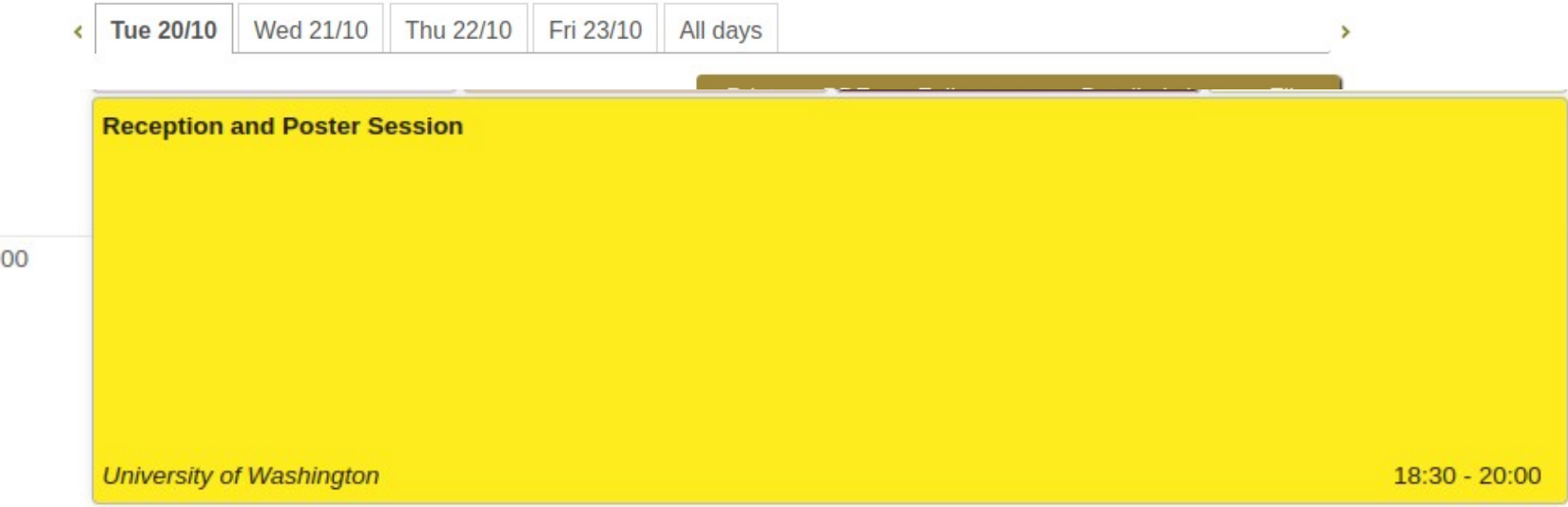
Speaker: Jinlong Zhang (Argonne National Laboratory (US))

📎 DPF_CPAD_2026....

What is to come from CPAD

- **The funding landscape is changing quickly and in ways which are hard to predict**
 - Merger of High Energy Physics (HEP) and Nuclear Physics (NP) brings together two communities, but also leaves lots of questions to be answered
 - The instrumentation community naturally spans these two areas and should work to understand what this means
 - The prioritization of Quantum and AI at the national level behooves us to think about how the instrumentation community can participate in these areas
 - Some of this we are doing already (e.g. RDC 8), and some of this requires thinking how these new tools can be brought into our existing work
 - Major projects continue to provide well motivated and ambitious technology requirements across all areas of the instrumentation community
 - The tension between the needed R&D to realize these projects and their ambitious goals while still fostering transformative blue-sky R&D will always be center in our thoughts
- **We have panel discussions planned at this workshop to help seed these discussions and shape what CPAD can be engaged in during the coming year(s)**
 - We look forward to hearing from both experts and the community on these subjects over the next 4 days

Some notes on the workshop



- Today (Tuesday) we have the poster session and reception starting at 6:30pm
- Poster presenters will have drink tickets to distribute to those who come up and engage with the posters...so do be friendly!

Some notes on the workshop

◀ Tue 20/10 **Wed 21/10** Thu 22/10 Fri 23/10 All days

Morning Coffee

University of Washington

ECFA and DRDs

Auditorium, Alder Hall

DOE Remarks

Auditorium, Alder Hall

NSF Remarks

Auditorium, Alder Hall

Panel Discussion on Instrumentation Advocacy

Auditorium, Alder Hall

- Tomorrow (Wednesday) we start at 8:30am with important discussions from the DRD's, DOE, and NSF followed by a panel discussion
- After lunch, there is a session on facilities which will highlight a lot of resources available across the US for instrumentation

Some notes on the workshop

Tue 20/10

Wed 21/10

Thu 22/10

Fri 23/10

All days

- Thursday we start at 9am with featured talks from our early presenters from across the RDC's

Morning coffee

University of Washington

08:30 - 09:00

Plenary: Training and Early Career Presentations

Quentin Buat

Auditorium, Alder Hall

09:00 - 10:20

- We will have a banquet at 7pm in the Walker-Ames Room in Kane Hall



Walker-Ames Room, Kane Hall

Some notes on the workshop

	Tue 20/10	Wed 21/10	Thu 22/10	Fri 23/10	All days
08:00	Morning coffee <i>University of Washington</i> 08:00 - 08:30				
	Instrumentation Highlights in HEP Projects <i>Auditorium, Alder Hall</i> 08:30 - 08:55 <i>Charlie Young</i>				
09:00	Instrumentation Highlights in NP Projects <i>Auditorium, Alder Hall</i> 08:55 - 09:20 <i>Sven Vahsen</i>				
	Panel Discussion on HENP Synergies and Community <i>Auditorium, Alder Hall</i> 09:20 - 10:00 <i>Charlie Young et al.</i>				

- Friday starts at 8:30 am with important presentations from HEP and NP and a panel about the merger and the instrumentation community
- There is also guided tours of the CENPA facilities here at UW starting at 1pm that day!

My chance to say Thank You



- It has been such an honor and pleasure to serve on CPAD over the last 4 years getting to engage ~800+ people over 4 conferences
- I've gotten to work along side of leaders in the field from all different background and experiences and I have cherished all these interactions
- **My special thanks to Petra Merkel and Jinlong Zhang** with whom I have served as co-chair with and who have supported me enormously throughout these years

Conclusions

- The US instrumentation community via CPAD is working to form collaborations to tackle the larger detector R&D challenges facing the HENP community
- It is my sincere hope that this can be done in collaboration and harmony with the CERN based DRD's as well as the long term high priority projects identified in the P5 report
 - Identifying key areas of overlap and looking for areas of opportunity will be a big part of this process
- I hope the process can be done without a heavy hand, as the nature of this work is **explorative, adaptive, and prone to failure (it wouldn't be R&D otherwise)**
 - Instead let us focus on bringing together the world experts to tackle some groundbreaking instrumentation. Let us bring together some of the cutting edge resources, processes, and collaborations to allow us to fulfill what only advances in instrumentation can do:

“Measure what is measurable, and make measurable what is not so”

We stand at a decade of HEP with immense ambition and challenge ahead of us to realize the next generation of facilities, detectors, sensors, and experiments which will light the way to the next major discoveries in physics