

Workshop Highlights & Closeout

Jonathan Asaadi, Jinlong Zhang
10/23/2026, Seattle

Another Great Workshop



- 7.5 plenary, 24 parallel, 1 poster sessions; 1 special event
- 174 presentations, 20 posters, 3 panel discussions
- Three types of tours, high school student visit
- >200 in-person participants

The Local Organizing Committee and Supporting Team



Shih-Chieh Hsu
Quentin Buat
Alvaro Chavarria
Claudio Savarese
Peter Kammel

Maria Laura di Vacri
Richard Saldanha
Isaac Arnquist
Samuel L Watkins

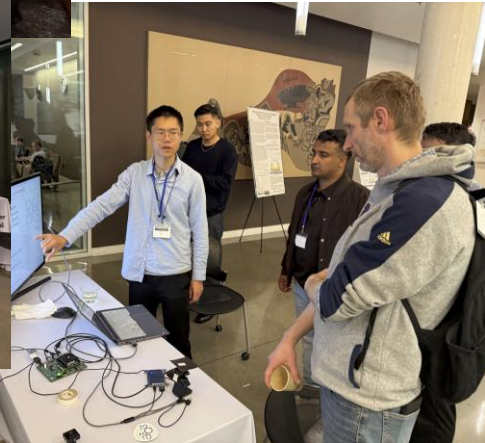
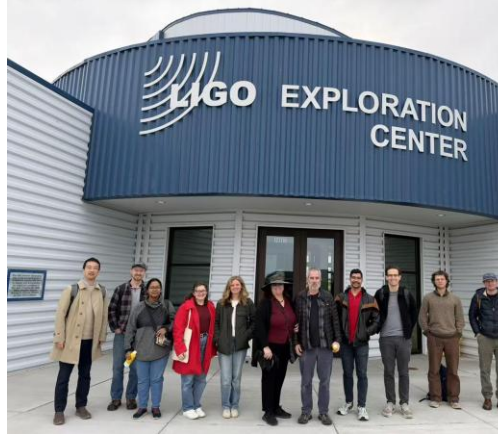


Student helpers (Husky)

Lara Dodd
Kieran Enzian
Noah Hayden
Madeleine Hibbert
Owen Huang
Pavel Ivanov
Talia Ling
Senuka Liyanage
Sophia Lu

Colin McKenna
Katherine Merrill
Evan Myers
Lyuja Pan
Anika Paudel
Ramya Sridharan
Shayla Sutliff
Bradley James Taylor

Great Social Events



Poster Award

- Google AI: At the **CPAD 2026 Workshop** (Coordinating Panel on Advanced Detectors) held at the University of Washington in Seattle from October 20–23, 2026, poster award eligibility requires posters to be presented in person and uploaded to Indico by the deadline.

Poster Award



The Project 8 Cavity CRES Apparatus: A Low-Background Resonant-Cavity Detector for Precision Electron Spectroscopy

Paul Kolbeck¹, Stephen Kuenstner¹, **Ali Kurmus¹**, Elise Novitski¹, Yao Yin¹, Meg Wynne¹ for the Project 8 collaboration

Poster ID: 173 Email: akurmus@uw.edu Early-Career-Scientist Slack: Ali Kurmus ¹University of Washington, Seattle, WA, USA

Ali Kurmus (University of Washington)

“One of the most enthusiastic presenters I’ve ever encountered”

An Open-Source Waveform Digitizer ASIC

Vikas Kumar, Keisuke Yoshihara, Thomas E. Browder, Boris Murmann • University of Hawai‘i at Mānoa • CPAD 2026

Vikas Kumar (University of Hawaii)

“A complex topic demonstrating the applications of AI in instrumentation given with great clarity”

DPF Instrumentation Award 2026

- **Instrumentation Award: Mark Vagins (Tokyo U. IPMU and UCI)**
 - *For pioneering the conception and realization of gadolinium-loaded water Cherenkov detectors, enabling efficient neutron tagging and opening new opportunities in neutrino and dark-matter physics.*
- **Instrumentation Early Career Award: Matthew Szydagis (Albany)**
 - *For creating and advancing NEST, a widely adopted framework for noble-liquid detector response that has enabled precision detector design, calibration, and analysis in dark matter and neutrino experiments, and for pioneering the Snowball chamber concept for particle detection.*



Graduate Instrumentation Research Award 2026

- **Hafez Ali** (University of South Dakota)
 - *Cryogenic Characterization of Digital Silicon Photomultipliers and Their High-Energy and Nuclear Physics Applications*
- **Alain Fauquex** (UC Berkeley)
 - *From a Handful to a Focal Plane: Scaling SQUAT Arrays for BREAD*
- **Siddhant Mehrotra** (Yale University)
 - *Levitated Solid Xenon Sensors for Nuclear Decay Detection: A Pathfinder Toward Sterile Neutrino Searches*

RDC 1: Noble Element Detectors

- Summary of RDC target area and priorities
 - *Planing on revisiting these in the coming year*
 - RDC1-WP1: Enhance and combine existing readout modalities
 - RDC1-WP2: New modalities for signal detection
 - RDC1-WP3: Challenges in scaling technologies such as purification, radiopurity, doping, high voltage, and other target challenges

- Workshop statistics

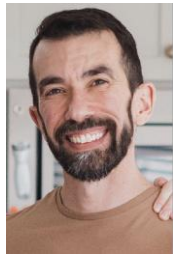
- 14 RDC parallel talks + Lots of overlap with activities in RDC 2 and RDC 4
 - 2 Posters

- A few highlight results

- First spectroscopic measurement of VUV luminescence in dual phase Xenon ([see Kelsey's Talk](#))
 - First results from calibration run of the Scintillating Bubble Chamber (SBC-10) detector ([see Ryan's Talk](#))

- Key message for the community

- Anticipating more activity from this RDC in 2027



Jonathan Asaadi Carmen Carmona

	Signal	Function	Peak wavelength (nm)	FWHM (nm)
Liquid	S1 singlet	Gaussian	$175.5 \pm 0.2_{\text{stat}} \pm 0.5_{\text{sys}}$	$10.9 \pm 0.4_{\text{stat}}^{+0.8}_{-0.6_{\text{sys}}}$
	S1 triplet	Gaussian Spline	$177.3 \pm 0.2_{\text{stat}} \pm 0.4_{\text{sys}}$ -	$12.4 \pm 0.5_{\text{stat}}^{+0.5}_{-0.3_{\text{sys}}}$ -
Gas	S1 singlet	Gaussian	$169.5 \pm 0.9_{\text{stat}}^{+1.9}_{-1.1_{\text{sys}}}$	$9.9 \pm 2.1_{\text{stat}}^{+4.3}_{-1.8_{\text{sys}}}$
	S1 recombination	Gaussian	$172.5 \pm 0.3_{\text{stat}} \pm 0.3_{\text{sys}}$	$12.7 \pm 0.7_{\text{stat}} \pm 0.5_{\text{sys}}$



RDC 2: Photodetectors

- Summary of RDC target area and priorities

- RDC2 (Photodetectors) covers photon detection for HEP across the full chain: sensors, photocollectors, readout, and photonics.
- The priority directions follow the Basic Research Needs report:
 - extending the wavelength range, from VUV to SWIR;
 - single-photon sensitivity with high timing precision;
 - operation in extreme environments (cryogenic, magnetic field, high voltage);
 - large-area, low-cost coverage;
 - integration of sensor and readout into digital photodetectors.

- Workshop statistics

- 1 early-career plenary talk
- 18 parallel talks in 3 sessions: VUV & noble liquids; a-Se & low-noise imagers; fast timing, photon sorting & imaging.
- 1 poster, Presenters from 13 institutions; 15 in person+3 remote talks.

- A few highlight results

- Digital SiPM (3D-PDC): 160 ps single-photon time resolution (SPTR) and 50% PDE (ORNL–Sherbrooke)
- DELTA, a new-generation concept for a class of digital photodetectors and a multi-institution R&D platform. First advances presented
- Skipper-CMOS at 0.096 e⁻ rms; MAS-CCD on-sky (FNAL/UCicago)
- Ge-CCDs beyond the Si cutoff, to about 1.7 μm (BNL/MIT LL)
- Dichroicons for Cherenkov/scintillation sorting in Eos (UC Berkeley)

- Key message for the community

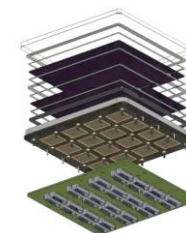
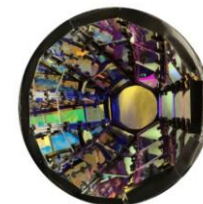
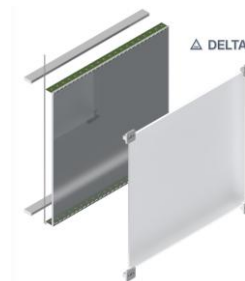
- Photodetectors are becoming integrated digital systems, which needs coordinated R&D across labs, universities and RDCs.
- Large-scale applications need industrial partners and sustained support



Flavio Cavanna



Shiva Abbaszadeh



RDC 3: Solid State Tracking

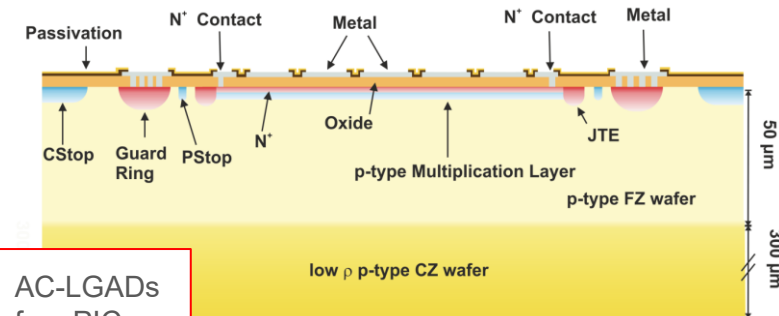
- Summary of RDC3 target area and priorities
 - Strong effort ongoing in MAPS and LGADs as well as interesting new materials and structures
- Workshop Statistics
 - 21 parallel talks (5 shared with RDC4), 2 posters
- A few highlight results
 - Studies of gain saturation in LGADs
 - ML-based reconstruction in RSDs
 - New thin film technologies for detection
 - 4D tracking collaboration forming
 - Spiking neural networks introduced: NEUROPix
 - Advances in WBG materials



Doug Berry

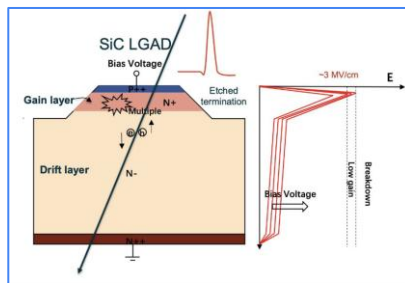


Sally Seidel

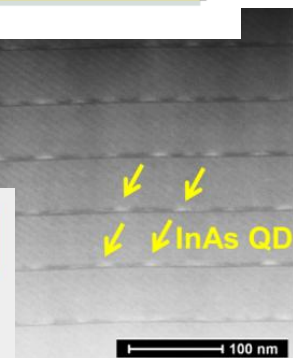
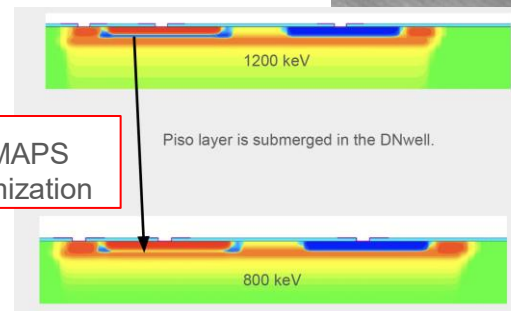


AC-LGADs
for ePIC

Metal

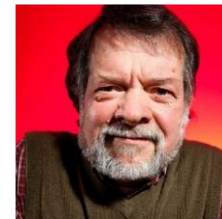


HV-MAPS
optimization

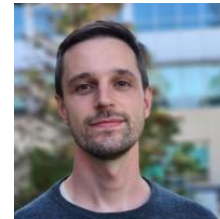


RDC 4: Readout and ASICs

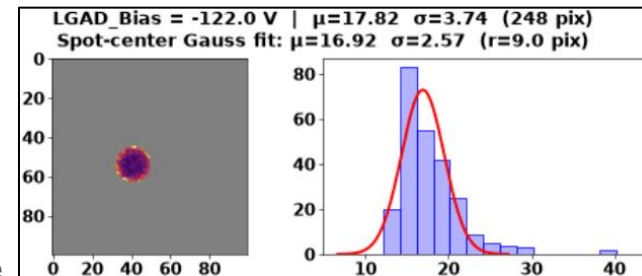
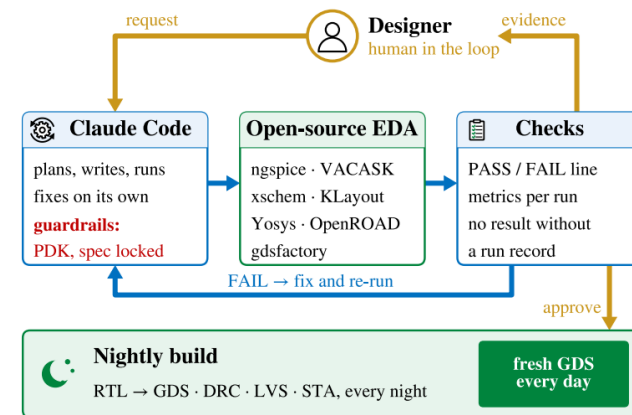
- **Summary of RDC target area and priorities**
 - A lot of work is going into pixelated readout
 - Partial shift towards cryo applications, one of key priorities
 - On-detector intelligence: to be successful, needs stronger connection to other RDCs
- **Workshop statistics**
 - **34** abstracts, many cross-cutting
 - **12** talks in RDC4, **1** shared session with RDC3, **1** EC talk, **9** posters
- **A few highlight results**
 - Open-source ASICs & tools: Hawaii, cocotb, RTLswarm...
 - Interesting concepts in using AI/ML, but cautions as well
 - 4D tracking: we broke the 20ps barrier
- **Key message for the community**
 - ASICs overlaps with most of the other RDCs!
The communities should talk together more
 - Leverage national initiatives in AI/ML and microelectronics
 - Efforts towards shared access to technologies, tools, IP exchange



Mitch Newcomer



Lorenzo Rota



RDC 5: Trigger and DAQ

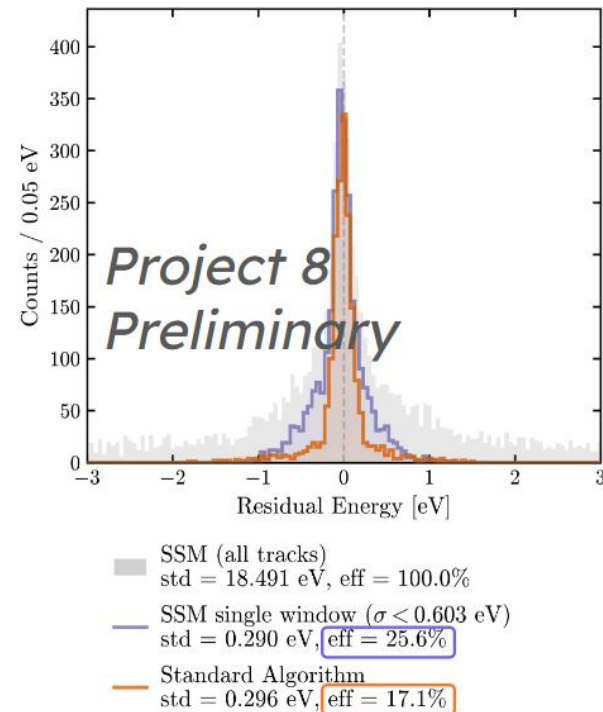
- Summary of RDC target area and priorities
 - AI/ML is getting popularity in a broad range of applications (triggering, data reduction, filtering, signal extraction)
 - Large interest in RFSoc boards and FPGAs.
- Workshop statistics
 - 8 presentations on Wednesday + 1 poster
 - In addition to that. 3 abstracts were co-listed as RDC4 and they were assigned to RDC4
- A few highlight results
 - “State-Space Model as Triggering and Reconstruction Algorithm in the Project 8 Neutrino Mass Experiment”:
 - “Development of a Streaming DAQ System for Beam-Size Monitoring at SuperKEKB”
 - “Fast machine learning trigger system for real-time event identification for Ba-tagging”
- Key message for the community
 - It pays to explore various AI/ML models and frameworks (HLS4ML, FINN, nn2FPGA)



Zeynep Demiraglı



Sasha Paramonov



RDC 6: Gaseous Detectors

- Summary of RDC target area and priorities
 - WP1 Advancing gaseous detector readout to the fundamental sensitivity limit
 - WP2 Developing new gas amplification structures for challenging environments
 - WP3 Achieving cost-effective scaling of gaseous detectors to large sensitive volumes and/or large readout areas
 - WP4 Achieving improved particle identification in gaseous detectors
 - WP5 Establishing production facilities in the United States
 - WP6 Reducing the environmental impact of gaseous detectors
 - cRDCs-WP1 Intelligence in the front-end electronics
 - cRDCs-WP2 Timing distribution with picosecond synchronization
 - cRDCs-WP5 Readout electronics for sub-10ps timing detectors
- Workshop statistics
 - 11 talks, 3 posters
- Key message for the community
 - Gaseous detectors are continually evolving and widely used in HEP and NP



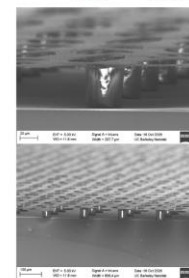
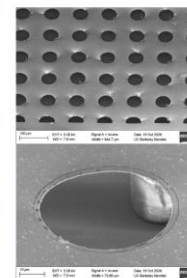
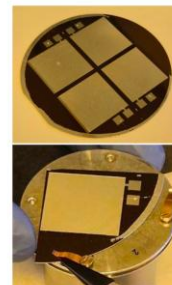
Bob Azmoun



Sven Vahsen

Highlights:

Microstructure Fabrication



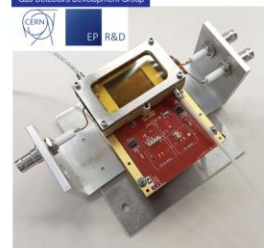
Tanner Polischuk / CPAD 2026

LBL/Hawaii/U.T. Arlington: US-based

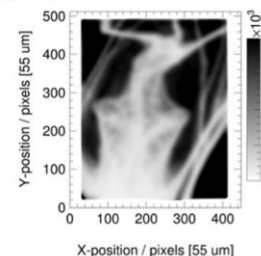
MPGD fab & readout targeting $3e^-$ noise (!)



X-ray imaging with MPGDs



GEMPix4: triple GEM with Timepix4 readout



RDC 7: Low-Background Detectors



Laura di Vacri



Dan Baxter

- Subset of RDC target area and priorities

- Reduction of Rn backgrounds and improved assay techniques
- Advancing CCD detector dark rates

- Workshop statistics

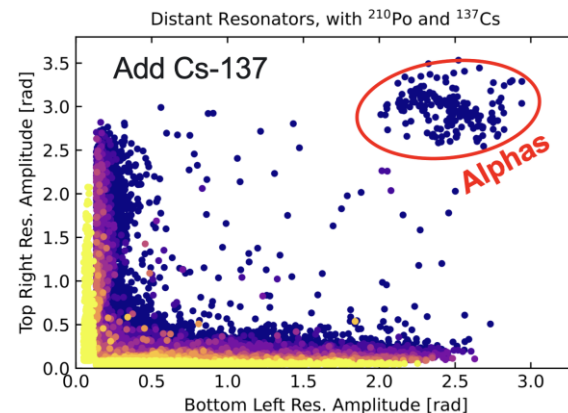
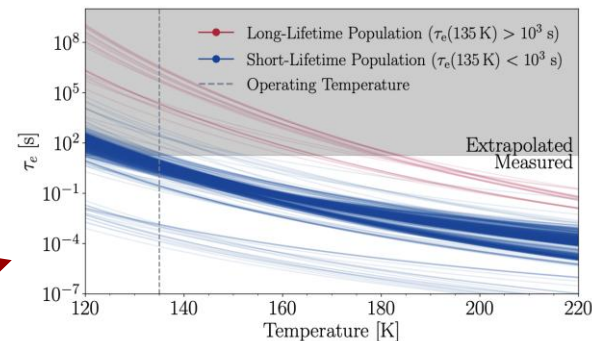
- **26** cross-listed abstracts
- **1** EC talks, **12** RDC7 talks, **5** joint talks w/ RDC8 on the Low-Energy Excess, **3** posters

- A few highlight results

- Ansh Desai, [arXiv:2610.22418](https://arxiv.org/abs/2610.22418)
- Samuel Watkins, (arXiv to post)

- Key message for the community

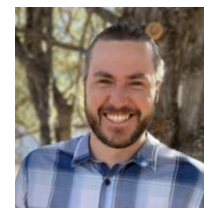
- In an era of restricted funding, background controls are often the first thing to get cut, but remain centrally important to project success.



RDC 8: Quantum and Superconducting Sensors

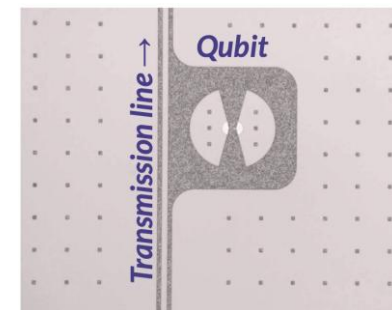
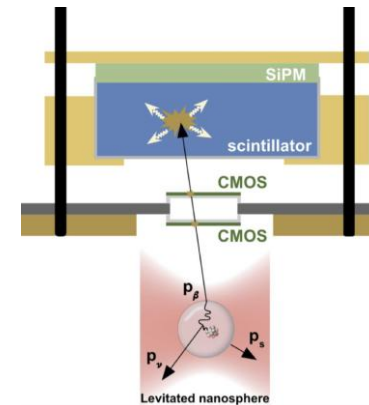


Rakshya Khatiwada



Caleb Fink

- Subset of RDC target area and priorities
 - Pairbreaking, photon & phonon sensors
 - Coherent wave sensors
 - Theory, simulation & material developments
- Workshop statistics
 - **31** cross-listed abstracts
 - **1** EC talk, **16** RDC8 talks, **5** joint talks w/ RDC7 on the Low-Energy Excess, **3** posters
- A few highlight results
 - Substantial progress is qubit based sensor development and testing (SQUATs, QPDs, etc)
 - Increased interest in device fabrication considerations, and exploration of new SC materials
 - Lots of interesting research on non-superconductor based sensing technologies
- Key message for the community
 - Quantum sensing is increasingly overlapping with condensed matter physics - the community needs to engage with CM colleagues and program managers to identify priority areas of overlap



RDC 9: Calorimetry

- Summary of RDC target area and priorities
 - New detector materials, wavelength sifters, and photon detectors
 - Fast (ps) timing calorimeters
 - Large scale system challenges (electronics, dataset); can AI/ML help?
 - Scalable calorimetry (large volume, low cost)
- Workshop statistics
 - 1 EC talk
 - 2 summary talks from Calor2026 and DRD6
 - 10 parallel talks
 - 1 round table
- A few highlight results
 - Calorimeters become imaging detectors? (fine segmentation and timing provide topology)
 - Liquid scintillator expands the detector design space
 - Simulation and reconstruction are central to detector development (GPU optical transport, AI-assisted, etc.)
 - Dual readout improves shower reconstruction (C/S separation)
- Key message for the community
 - RDC9 goals closely intertwined with several other RDCs (in particular RDC2, RDC4, RDC11)
 - We propose to revise the BRN work, focusing on interdisciplinary grand challenges to develop integrated solutions from detector to data flow architecture optimized for specific goals (for example, fast timing, mass minimization, high spatial resolution)



Minfang Yeh



Marina Artuso



NASA testbeam for 3D opaque Scintillators



Work on timing layers for future calorimetry



30-ton testbed for future liquid calorimetry



DESY testbeam: Multi-Institute Team

RDC 10: Detector Mechanics

- This small community is fully occupied by the ongoing HL-LHC upgrade activities
- There was no session at this workshop because of the limited number of abstracts
- But there are interesting activities ongoing in DRD8



Eric Anderssen



Andy Jung

RDC 11: Fast Timing

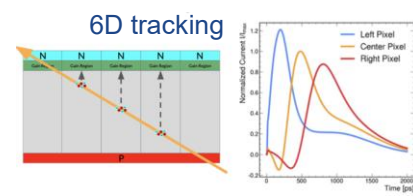
- Summary of RDC target area and priorities
 - Developments that continue to push timing resolutions into the psec regime (and beyond)
 - Scalable fast-timing systems
 - Development of physics techniques that exploit timing in novel ways
- Workshop statistics
 - 2 sessions (Tu/Th); 7 technical talks spanning silicon, diamond, photonic, optical, and superconducting technologies.
 - Applications range from collider tracking and beam instrumentation to neutrino physics and cryogenic-detector readout.
- A few highlighted results
 - Fast readout and detector systems for muon beam monitoring
 - Time-to-digital conversion using novel photonics
 - Continued progress in LGAD development - pushing toward O(10) ps resolution and fine pixelation; Enabling directionality (6D tracking) and low-pT TOF
 - Fast diamond-based detectors
 - Time-domain simulation of SQUIDS
 - New opportunities for hybrid Cherenkov/Scintillation neutrino detectors
- Key message for the community
 - Timing sits at the nexus of many different technologies and experimental areas - provides an interesting context for cross-pollination
 - RDC-11 is resuming a regular meeting with opportunities to present to a broad community; We encourage interested researchers to join our listserv cpad_rdc11@fnal.gov and get plugged in



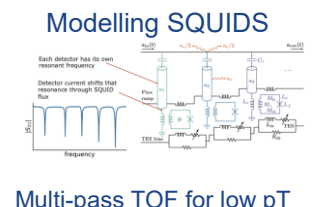
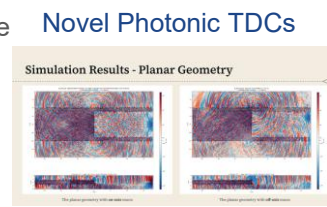
Roger Rusack



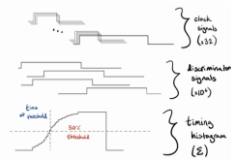
Matt Wetstein



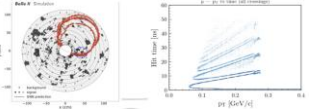
Eos



Fast Muon Beam Monitoring



Multi-pass TOF for low pT



Fast-Diamonds



Landscape & Perspective

- Plenary sessions for the broad topics
 - National initiatives and HEP in Genesis Mission
 - Agency and International
 - DRDC report on the ECFA and DRD updates
 - DOE and NSF remarks on the status, challenges and opportunities
 - HENP projects and community
- Panel discussions
 - Instrumentation in AI era and BRN updating
 - Instrumentation advocacy
 - HENP projects and community

Universities & Labs

SUMMARY

Instrumentation in HENP at the University of Washington

- 1 Precision through frequency**
CRES, cavity haloscopes
- 2 Single-quantum sensitivity**
Single electrons in CCDs, single microwave photons
- 3 Ultra-low backgrounds**
CCDs, germanium and selenium in clean environments
- 4 Precision at high rate**
LYSO calorimetry and LGAD 5D tracking; Fast ML (A3D3), ATLAS ITk mechanics

UW CONTRIBUTIONS AT THIS WORKSHOP

ADMX O. Kim · K.ENZIAN · M. Carhart · J. Sinnis (talks)

Project 8 Y. Yin (talk) · M. Wynne, P. Kolbeck, A. Kurmus (posters)

DAMIC-M A. Chavarria (talk)

Selena E. L. Solis (talk)

PIONEER F. Gray · J. Yar

A3D3 (Fast ML) O. Huan

Legend S. Bellman · C. S



U.S. DEPARTMENT
of ENERGY
National Laboratory

Pacific Northwest National Laboratory

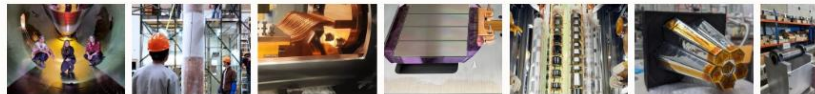
Located in southeast Washington state
(~ 3.5 hrs from Seattle)

Founded in 1965

Origins trace back to Hanford site for
plutonium production in World War II

~ 6000 staff members

PNNL's core capabilities :
Chemical and Material Sciences
Computational and Mathematical Sciences
Earth and Biological Sciences



~ 600 acres

Great Legacy, Bright Future

Remembering Henry



Henry Lubatti (1937 - 2026)

Excellent physicist, great colleague and generous mentor.

Henry's influence is woven directly into our community.

We will miss him dearly.

Early Career Presentations

High Energy Physics Consortium for Advanced Training (HEPCAT) <i>Auditorium, Alder Hall</i>	<i>Maxwell Chertok</i>	
	09:00 - 09:20	
Photon-to-Digital Converters (3D-PDCs) <i>Auditorium, Alder Hall</i>	<i>Amanda Lynn Steinhebel</i>	
	09:20 - 09:35	
Progress on the TESSERACT Superfluid Helium Detector <i>Auditorium, Alder Hall</i>	<i>Samara Steinfeld</i>	
	09:35 - 09:50	
Kinetic Inductance Quantum Sensing Technologies for THz HEP and Dark Matter Searches <i>Auditorium, Alder Hall</i>	<i>Chris Albert</i>	
	09:50 - 10:05	
Measurement of Large-Area Ultrafast Silicon Detectors for Embedded Timing/Imaging Layers in Sampling Calorimeters <i>Bridget Mack</i>		
Coffee break		
<i>University of Washington</i>	10:20 - 10:50	
ALICE ITS3 MOSAIX sensor measurements and developments for ePIC SVT <i>Auditorium, Alder Hall</i>	<i>Gregor Hieronymus Eberwein</i>	
	10:50 - 11:05	
RTLswarm: a distributed, parallel simulator for RTL-defined chip networks <i>Auditorium, Alder Hall</i>	<i>Kalindi Gosine</i>	
	11:05 - 11:20	

Guard Change



**Thanks to the outgoing CPAD chair
(2023-2027) Jonathan Asaadi (UTA)**



**Welcome the incoming CPAD vice-chair
(2027-) Mitchell Soderberg (Syracuse)**

Thanks to all the past CPAD members and RDC coordinators for many years great work and welcome the incoming ones!

CPAD Workshop 2027

TBD

Parting Message

- Thanks to you all for making effort attending this workshop under many constraints and uncertainties
- The challenges remain and more are emerging, and the environment around us is changing, let's engage, adjust and be up for them !
- We achieved a vibrant instrumentation community. Let's use this forum to collaborate and conduct impactful R&D work
- We look forward to working with the funding agencies to continue to support, promote, and accelerate this community.
- Safe travel and see you next year!