CPAD Updates

Jonathan Asaadi (UTA) & Jinlong Zhang (ANL)

DPF Community Meeting

05/21, 2026

Coordinating Panel for Advanced Detectors (CPAD)

- Mission and Goals
  - The Coordinating Panel for Advanced Detectors (CPAD), seeks to promote, coordinate and assist in the research and development of instrumentation and detectors for high energy physics experiments.
  - By helping to coordinate the development of both evolutionary and transformative detector instrumentation across the national laboratories and with the university community, CPAD works to ensure the future of high-energy physics experiments.
- Brief history
  - Formed in spring 2012 in response to an 18-month-long study by a task force appointed to address the organization of high-energy physics instrumentation.
  - Currently coordinated through the American Physics Society (APS) Division of Particles and Fields (DPF)
- CPAD 2026 members
  - Chair Jonathan Asaadi (UTA), Vice Chair Jinlong Zhang (ANL)
  - Nural Akchurin (TTU), Michalis Bachtis (UCLA), Eric Dahl (Northwestern), Prakhar Garg (Yale), Prashansa Mukim (BNL), Sally Seidel (UNM), Mitch Soderberg (Syracuse), Ritoban Basu Thakur (Caltech), Laura di Vacri (PNNL), Silvia Zorzetti (FNAL)

https://cpad-dpf.org/

Highlights of CPAD Activities

- Annual Instrumentation Workshop
- DPF Instrumentation Award and DPF Instrumentation Early Career Award, Graduate Instrumentation Research Award (**GIRA**)
- Coordinating SBIR/STTR Input when requested by DOE
- Coordinating the generic R&Ds of US HEP instrumentation community
  - Prioritized technology R&Ds in R&D collaborations (**RDC**s)
  - The annual process for proposal preparation for comparative review NOFOs and other funding opportunities
  - Communications and collaborations with DRDs
  - … …

CPAD Workshop

CPAD 2025 at Penn

Oct 7 – 10, 2025
Inn at Penn, University of Pennsylvania
US/Eastern timezone

- 227 Registered Participants
- 219 Abstracts
- 189 Talks
- 30 Posters

CPAD 2026 at Seattle

Oct 20 – 23, 2026

- Similar format as the previous years
  - Overviews, initiatives, big projects and synergies
  - R&D progress parallel sessions organized by RDCs
  - Early career sessions
  - Poster session

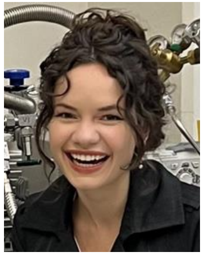
2025 Workshop (the 10th) was a great success, and we look forward to seeing you at 2026 Workshop at Seattle

DPF Instrumentation Award and GIRA

- Award information
  - https://cpad-dpf.org/?page_id=750
  - DPF Instrumentation Award since 2015, Graduate Instrumentation Research Award (GIRA) since 2018
- 2025 GIRA awardees

Earl Almazan (UCSC)

Brandon Sandoval (Caltech)



Olivia Seidel (UT Arlington)

  - Honorable mention **Annie Tan (Boston U)**
- 2026 process ongoing
  - GIRA application open soon
  - Instrumentation award nomination announcement soon

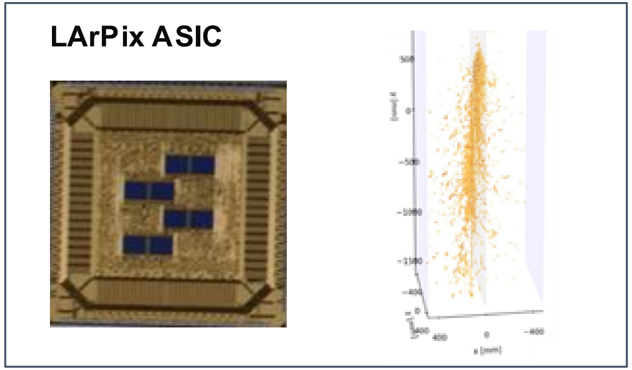
RDC Updates

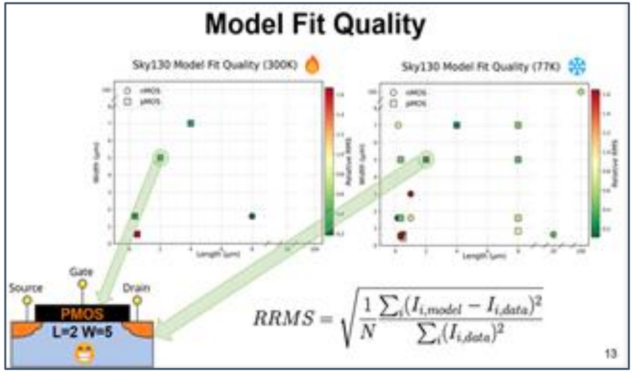
RDC	Topic	Coordinators
1	Noble Element Detectors	Jonathan Asaadi, Carmen Carmona
2	Photodetectors	Shiva Abbaszadeh, Flavio Cavanna
3	Solid State Tracking	Douglas Berry, Sally Seidel
4	Readout and ASICs	Mitch Newcomer, Lorenzo Rota
5	Trigger and DAQ	Zeynep Demiragli, Alexander Paramonov
6	Gaseous Detectors	Bob Azmoun, Sven Vahsen
7	Low-Background Detectors	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

Rotating out RDC coordinators and calling nominations from the community. Thanks a lot to the outgoing and welcome the new RDC coordinators.

Highlight 1: RDC4 Readout and ASICs

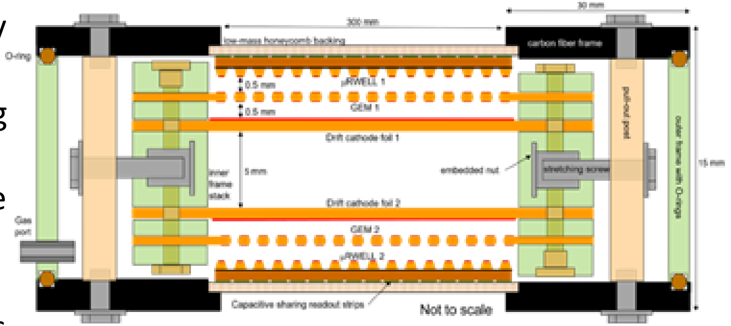
- RDC4 priorities including cross-RDC topics
  - Cryogenic integrated circuits
  - High-speed data links
  - Shared access to technologies, IP exchange & training
  - Intelligence in the front-end electronics
  - Timing distribution with picosecond synchronization
  - Monolithic Active Pixel Sensors
  - Pixelated detectors for 4D tracking
  - Readout electronics for sub-10ps timing detectors
- R&D progress highlights (2025 Workshop)
  - Development of Cryo-PDKs
  - ASICs with sub-50ps timing

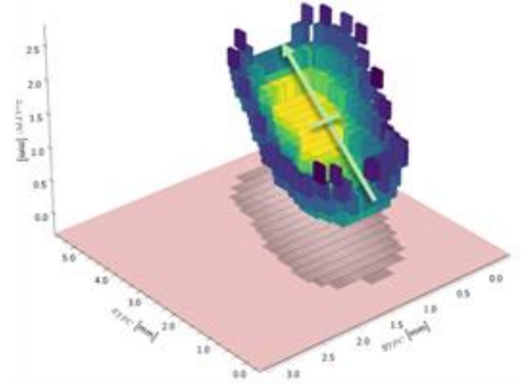




Highlight 2: RDC6 Gaseous Detectors

- RDC6 priorities
  - Advancing gaseous detector readout to fundamental sensitivity limit
  - Developing new gas amplification structures for challenging environments
  - Achieving cost-effective scaling of gaseous detectors to large sensitive volumes and/or large readout areas
  - Achieving improved particle identification in gaseous detectors
  - Establishing production facilities in the United States Production facilities in the United States
  - Reducing the environmental impact of gaseous detectors
- R&D progress highlights (2025 workshop)
  - Thin-gap uRWELL Hybrid Detector R&D
  - TPCs w/ pixel ASIC readout for directional fast neutron monitoring





Process for Proposal Preparation in 2025

- A mini BRN process in 2025 yielded a set of RDC priorities
  - The priority document was made available to the community
  - Encouraged the proposals to cite the priority document and highlight the scope consistency with the individual priorities
  - Prepared collaboration letters as needed
- Multi-Institutional Team Proposal (1st opportunity in this kind)
  - **Pre-application:** February 27th (Friday), 2026
    - >40 proposals submitted
    - Great to see the active engagement by the community!
  - **Encourage/Discourage notification:** March 30th, 2026
    - ~25% invited for full proposal
  - **Full Applications Due:** June 1, 2026
    - 1-3 awards expected
- HEP detector R&D funding situation in FY2026 is still decent though lower than FY2025
  - Impact on individual PIs are different
  - University comparative review results are being communicated
    - Particularly difficult to maintain support for ongoing activities AND enable new, early career PIs to enter the field

ESG Recommendations & DRDs

- ESPP 2026 Update report with statement ”*Detector R&D is essential for realising future experimental research programmes. … …*” and the following recommendations:
- 6E. For the DRD collaborations to address the requirements of future flagship projects, they must receive adequate funding. New R&D topics and initiatives should be integrated in the DRD scheme. The General Strategic Recommendations in the roadmap must be fully addressed by dedicated initiatives coordinated across the DRD collaborations.
- 6F. A coherent, strategic approach and sufficient resources to support close cooperation with industry are required to address the rising costs and growing complexity in engineering, particularly in microelectronics.
- 6G. To enhance efficiency and align developments with global technology trends in other fields, standardised, off-the-shelf solutions should be prioritised over custom designs, where applicable.

28 April 2026

Listing of US institutions and funding agencies in DRD MoU Annexes

US institutions should not sign the main body of the MoU, unless they have their own sustained funding.

- In Annex 1, "Collaborating Institutions and their Contact Persons", list the U.S. institutions in the default table format together with all other institutions:

Country	Collaborating Institution	Town	Institution Code	Contact

No special US-specific footnote should be added under this table.

- In Annex 2, "Funding Agencies and their Representatives", containing the following table:

Country	Funding Agency	Funding Agency Code	Representative	Institution(s) represented

Neither DOE nor NSF are to be listed at all in this table, and in particular *no line for each U.S. institution added* stating 'Pending Agreement' as funding agency, since this could be read as implying DOE or NSF (e.g. U.S. national labs are DOE funded).

- U.S.-affiliated individuals in leadership positions (such as (deputy) spokespersons, resource coordinators or work package coordinators) together with their institute affiliation can be listed in the Annexes, again without implying that support for such positions is covered by the U.S. funding agencies.
- The listing of participating institutions and funding agencies in tables in Annex 6 (Work Packages) and Annex 7 (Working Groups) should follow above guidance for Annex 1 and Annex 2.
  If a US institution is listed in a work package or working group, the collaboration must be sure they *already* have a grant or other sustained funding, and not the other way around.
- Finally, for the whole MOU and all its annexes, all DRDs need to ensure that neither DOE nor NSF (or their spelled-out equivalents) are mentioned anywhere.

Summary

- Thanks to DPF for this opportunity
- Articulated R&D priorities and invigorated instrumentation community by RDCs
- With constrained resources, coherency and efficiency, as well as alignment with strategic priorities, are critical for us to continue impactful advanced detector R&Ds
  - While leverage large initiatives and utilize synergies
- Please join CPAD (this is the instrumentation community, not a project)

  CPAD@LISTSERV.FNAL.GOV

U.S. RDCs

- Detector R&D efforts in many different technology areas are essential to realize the planned future experiments spanning all frontiers in High Energy Physics (HEP)/Nuclear Physics (NP)
- Much of the efforts needed require **collaboration** and **coordination** in order to realize the technologies required
  - **Collaboration**: The required expertise/resources/new ideas often live within multiple people, institutions, labs and only by bringing these pieces together can we hope to realize the technological challenges
  - **Coordination**: In a resource limited environment we need cohere efforts, minimize duplication, and build off progresses happening elsewhere
- Note that future projects likely have established R&D organizations (targeted R&Ds)
  - RDCs are created with generic R&D focus, are working closely the targeted R&Ds to optimize the resources and promote the work being done
  - There are ongoing R&D projects/activities that comprise both generic and targeted aspects, and RDCs are working with those for smooth evolvement and transition as appropriate
- Continuously enhancing communication with CERN DRDs, each having the scope of a US RDC and all relevant project specific R&Ds (though DRDs and RDCs don't have 1-to-1 match)

Facilities

- Future experiments will operate in demanding environments: temperature, magnetic field, radiation, low-background, low-power, …
- It is vital to develop and maintain critical facilities, centers and capabilities for the sharing of common knowledge and tools

Test Beams	Irradiation	Magnet	Noble Liquid
Test beams with expanded capabilities	High-flux irradiation facilities using different particle types	General-purpose high-field magnet platform	Noble Liquid platform for neutrino and other cryogenic experiments
Quantum Systems	**Low-Background**	**Characterization**	**Calibration**
General-purpose platform for quantum sensors	Assay and low-background facilities	Platforms for fundamental properties studies	Platform for calibration and systems design

CERN DRD

DRDs should cover Strategic R&D

European Strategy for Particle Physics

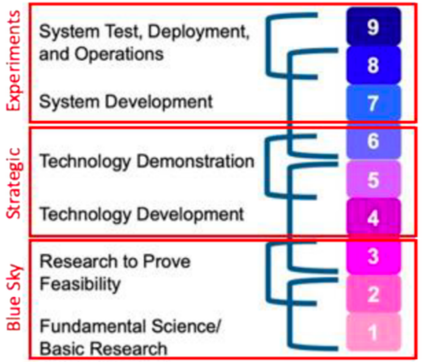
T. Bergauer

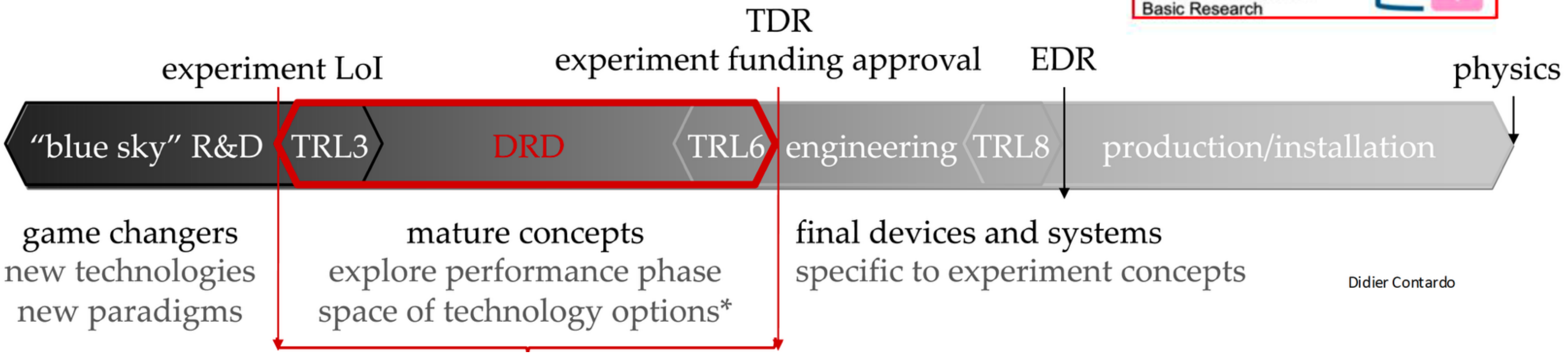
Strategic R&D bridges the gap between the idea (“**blue sky research**”, low TRLs) and the **deployment and use in a HEP experiment** (TRL 8-9)

Covers the **development and maturing of technologies**, e.g.

- Iterating through different options
- Improving radiation hardness
- Scaling up challenges: detector area, number of channels, layers,..
- …

„NASA“ TRL levels:





Didier Contardo

DRD Status

T. Bergauer

The DRD Collaborations

European Strategy for Particle Physics

Eight DRD collaborations have been approved for an initial period of 3 years (extendable) with different histories and “maturity”:

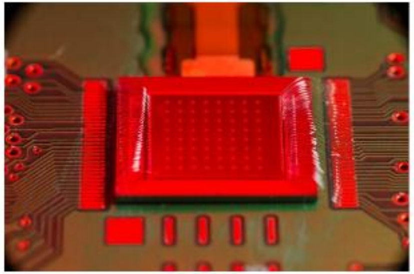
- Based on previous R&D collaborations:
  - **DRD1: Gaseous detectors** (based on RD51): *161 institutes, 700++ people*
  - **DRD3: Semiconductor Detectors** (previously RD42, RD50): *145 institutions / 700++ people*
  - **DRD6: Calorimetry** (CALICE, other proto-experiment collabs.): *135 institutes*

- Completely new: (community building, building trust, and finding benefit of being “CERN hosted”)
  - **DRD2: Liquid Detectors:** *86 institutes, 205 members*
  - **DRD4: Photodetectors & PID:** *74 institutes*
  - **DRD5: Quantum Sensors and emerging technologies:** *112 involved groups*

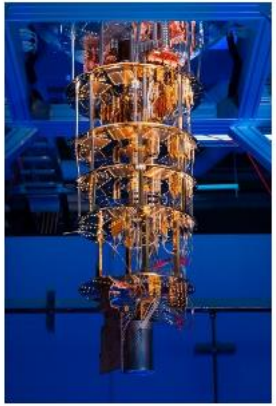
- Transversal activities: no service provider, but with genuine R&D interest (TF9 → ECFA Training Panel)
  - **DRD7: Electronics:** *67 Institutes*
  - **DRD8: Mechanics & Integration:** *38 institutes*

National Initiatives

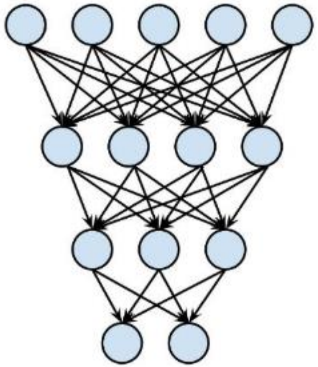
- Utilize effectively the national initiatives relevant to HEP instrumentation
  - Contribute with adequate resources and to planning matters
  - Play equal or major partners Shape and define the initiatives
  - Enhance connections to other programs, other offices/agencies, private foundations/commercial partners, and global collaborations



Microelectronics



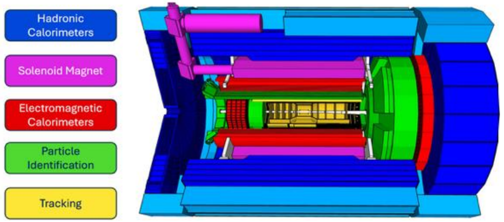
Quantum Information Science

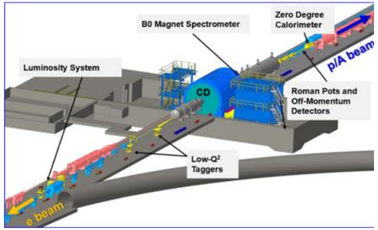


AI/ML

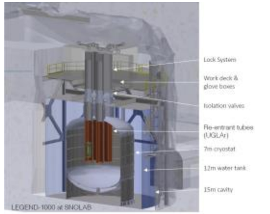
Synergies with NP

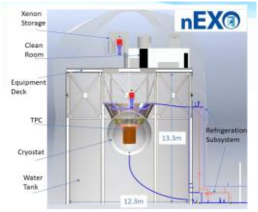
- Great synergies between HEP and NP in many technology areas
    - ePIC detector
        - Si based tracking
        - MPGD
        - Calorimetry
        - PID
        - Electronics





- Ton-Scale $0\nu\beta\beta$ detectors
    - CUPID: bolometer with heat and light
    - nEXO: LXe TPC with ionization and light
    - LEGEND: HPGe detectors operated in liquid argon
- … …





- Keys to the success of this enterprise are people, facilities and resources, and connections and collaborations
    - Advanced workforce and research collaborations
    - Unique facilities and capabilities
    - Connections to other programs, other offices/agencies, private foundations/commercial partners, and global collaborations