

RDC4 Meeting Dec 12, 2024

# CPAD 2024 -- RDC4 Electronics & ASICs

<https://indico.phy.ornl.gov/event/510/page/138-conference-program>

~260 in person (and a few remote) participants

- 64 students

8 plenary sessions

29 parallel sessions (with 163 presentations)

21 posters

Special topic:

**50 years of TPC's Wednesday Morning in 4**

**Plenary talks finishing up with**

**David Nygren's recollections**

**Ian Shipsey Memorial by Marcel Demarteau**



*see also Closeout presentation for a brief synopsis by RDC topical area : [CPAD Closeout](#)*

# CPAD summary RDC4: Readout and ASICs

Lorenzo Rota  
Mitch Newcomer

- Workshop statistics: 4 parallel sessions, 24 presentations
- Highlights
  - 4D tracking: collaboration is forming, highlights from 1st workshop
  - TPC pixel readouts:
    - LaArPix and beyond...  
Qpix (ultimate power?), GamPix (20 el. w/trigger?), TopMetal (3 el. !!?)
    - Potential meetings between QPix and LaArPix community
- Cross RDC interactions:
  - RDC1: Readout ASICs for TPCs
  - RDC3: Sensors for 4D tracking
  - RDC3: MAPS
  - RDC3: Interconnections
  - RDC8: ASICs for SNSPD/SQUID biasing & readout
  - RDC9: we need closer collaboration

# CPAD summary RDC4: Readout and ASICs

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- Potential work packages
  - **4D tracking:** analog front-end, TDC, CFD, 3D integration
  - **Cryogenic:**
    - **mK-4K:** ICs for SQUID biasing & amplification, IPs (PLL, TDC)
    - **77-165K:** Analog front-end on 65nm, QPix news, LaArPix
  - **AI/ML:** Smart pixels, eFPGA, anomaly detection, unconventional computing
  - **Photon readout:** readout SiPM arrays, feature extraction from PMTs
  - **Photonic data links:** cryogenic & radiation-hard with ring modulators
- Discussions and Next Steps
  - Joint RDC04 & RDC09 (Electronics & Calorimetry) meetings to understand unique needs and potential service requirements for calorimetry.
  - MAPS vs wafer-wafer bonded hybrid: where do we draw the line?
  - ***Do we need/want an interconnect work-package? Joint discussion with RDC3***
  - AI/ML: where is the best place to implement it, and can we live with the area/power budget?
  - Potential services to other topical communities: e.g., SEU protection, verification, etc...

# Future topics for RDC4 meeting discussions

RDC4 – Service packages .. An interesting/useful topic being discussed in DRD7

- Sensor Module Simulation – CoDesign tools / Verification etc.. .
- Detector level generic support available to all topical areas encourage a detector aware design approach.
- Monitoring / Slow control ...

## Joint Meetings

- RDC 9 Calorimetry
- RDC 2 Photonics
- RDC 3 Readout Electronics for Solid State Trackers
- RDC 5 Triggering

etc...

# Discussion Today of a possible Interconnect work Package

## Novel Interconnect Techniques for Hybrid multi-D tracking Pixel detectors

- Mutual RDC3 (Solid State Tracking) - RDC4 ( Electronics) interest driven by the independence of Sensor of Readout Technology.
- What is the current “State of the Art” in interconnect
- What directed R&D is currently underway
  
- What Specifications would be compelling enough to garner Community interest.