CPAD RDC9 R&D plans

Introductory remarks by

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Areas of interest

1. New materials for calorimetry, and how they can be tailored to a specific application (including prospects from nanotechnology)
2. Front-end electronics needs for high energy resolution
3. Front-end electronics needs for picosecond timing calorimetry
4. System aspects (mechanical): low mass support & cooling
5. System aspects (electronics): powering scheme & interconnections
6. System aspects (data processing): “intelligent calorimeter”
7. Concepts from the above lines of investigation that can be adapted to hadron identification (time-of-flight, RICH…)

RDC9 goals

- Connect different communities interested in calorimetry:
  - Energy frontier - connections with CERN DRDs
  - Neutrino frontier
  - Rare processes and precision measurements frontier (quark flavor, precision experiments)
  - Astroparticle
- Develop generic interdisciplinary R&D efforts: intersections of research fields and technologies
- Develop connections with other relevant RDCs

Big ideas as of November 2023

- New materials optimized for different applications (high occupancy, precision time stamp, scalability (cost effectiveness, large masses), optimum resolution, high radiation.
- Sensor technologies:
  - Scintillators
  - Maps – use of CMOS technology for large scale structures
  - Ultrafast silicon (diamond, SiC..)
  - Metamaterial for tunable optical properties
- Optical coupling/light extraction
- Photon detection (interface with photon detector rdc)
- ASIC needs (energy & time measurement, waveform sampling, feature extraction, preservation of signal integrity in high occupancy events, interface with ASIC rdc, picosecond timing RDC)
- Large scale system (electronics/mechanics)

Recap of activities this year- 2024

No specific RDC oriented FOA; we were invited to prepare white papers for this solicitation, a few chosen for CPAD endorsement

2. FY 2025 HEP Comparative Review: HEP expects to convene merit review panels in November 2024 for research areas **(a)** through **(g)** below. Research applications, as described above, that are aligned with one or more of those research areas and are received **before** September 5, 2024, will be considered for merit review by those panels. Applicants are strongly encouraged to submit pre-applications prior to August 1, 2024.

Calorimetry R&D proposals – where are now

White Papers	Subject	Main Proponents
Novel geometry HCAL	5-D calorimeter design for optimal performance with AI/ML	A. White
time & high-granularity HCAL	The ADRIANO3 Triple-Readout Calorimetric	C. Gatto et al
Allegro LAr	FCC Detector R&D Program: EndCap Calorimeter Concept	J.Rutherfoord and E.Varnes
Calvision	Maximum information calorimetry	B. Hirosky et al
Digital hadron calorimetry	Calice-style HC	Bikki/Yonel
Maps	High-granularity sampling calorimeter	J. Brau (Oregon/SLAC)
Ultrafast silicon and other SC	Ultrafast material for sampling calorimeters/timing layer/HID	M. Artuso (at the moment idea being discussed with RDC3,RDC11)
RADiCal	modular test system for high performance, ultracompact, sampling EM Calorimetry	R. Ruchti
Radiation-Hard components	Scintillators/wavelength shifter (target fluence?)	Bikki/Yonel
Inorganic scintillators	Optimized for different specs	Zhu
Secondary emission active media	New materials for this application	Bikki/Yonel
Scintillator material for large calorimetry	Scalability for 3D projection chamber	G. Yang et al.
Theia	A broad physics program multiple R&D	Theia collaboration

2 presentations at July CPAD
July Townhall
None endorsed

Moving on

- Identify new common grounds emerging from the discussions at our parallel session
- Wednesday afternoon at 5PM we will have a discussion session to review original goals, and develop an action plan for next year:
  - Organize working groups around key themes
  - Identify liaisons to other RDCs to develop synergistic activities
- Resume monthly meeting in January 2025 to start planning generic R&D proposal

Please join us then!

The End