

# From Snowmass to P5 Update and plans and Detector R&D organization

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University of Texas at Arlington

CALICE Collaboration Meeting, March 2023

# EF – Higgs Factory

Strong support for e+e- Higgs Factory as a global priority.

Push for focused Detector R&D program in US.

# Snowmass – Energy Frontier Report

## The intermediate-future Energy Frontier collider

The  $e^+e^-$  colliders are the vehicle that will enable a high-precision physics program in the EW sector by increasing the precision of SM measurements. The physics case for an  $e^+e^-$  Higgs factory is compelling and the program is possible essentially with current technology. The various proposed facilities have a strong core of common physics goals that underscores the importance of realizing at least one such collider somewhere in the world. A timely implementation of a Higgs factory is important, as there is considerable US support for initiatives that can be achieved on a time scale relevant for early career physicists.

...and why not in the U.S. ?

The Energy Frontier also supports the possibility of a Higgs factory in the US. Given global uncertainties, consideration should also be given to the timely realization of a possible domestic Higgs factory, in case none of the currently proposed global options are realized.

# Snowmass – Energy Frontier Long term perspective

The US EF community has also expressed renewed interest and ambition to bring back energy-frontier collider physics to the US soil while maintaining its international collaborative partnerships and obligations.

The Energy Frontier community proposes several parallel investigations over the 2025-2035 period for pursuing its most prominent scientific goals, namely 1) completing the HL-LHC physics program, 2) proceeding with a Higgs boson factory and 3) planning for multi-TeV colliders at the energy frontier.

The proposed plans in five year periods starting 2025 are given below.

**For the five year period starting in 2025:**

1. Prioritize the HL-LHC physics program, including auxiliary experiments,
2. Establish a targeted  $e^+e^-$  Higgs Factory detector R&D program,
3. Develop an initial design for a first stage TeV-scale Muon Collider in the US,
4. Support critical detector R&D towards EF multi-TeV colliders.

**For the five year period starting in 2030:**

1. Continue strong support for the HL-LHC physics program,
2. Support construction of a  $e^+e^-$  Higgs Factory,
3. Demonstrate principal risk mitigation for a first stage TeV-scale Muon Collider.

**Plan after 2035:**

1. Continuing support of the HL-LHC physics program to the conclusion of archival measurements,
2. Begin and support the physics program of the Higgs Factory,
3. Demonstrate readiness to construct a first-stage TeV-scale Muon Collider,
4. Ramp up funding support for detector R&D for energy frontier multi-TeV colliders.

# P5 Town Hall Meeting

on the Future of High Energy Physics

Hosted by Brookhaven National Laboratory  
April 12-14, 2023



P5  
Town  
Hall

## Meeting

Apr 12 – 14, 2023  
Brookhaven National Laboratory  
America/New\_York timezone

Enter your search term

Meeting Homepage

Overview

Call for Remarks in the  
Open Session

Timetable

Contribution List

## Timetable

< Wed 12/04 Thu 13/04 Fri 14/04 All days >

Print PDF Full screen Detailed view Filter

08:00

Introduction and Reports from International Partners

09:00

Berkner Hall, Brookhaven National Laboratory

08:30 - 10:00

10:00

Coffee Break

Berkner Hall, Brookhaven National Laboratory

10:00 - 10:30

Energy Frontier

11:00

Berkner Hall, Brookhaven National Laboratory

10:30 - 12:00

Working in ALCC  
to define ILC talks

# P5

## Particle Physics Project Prioritization Panel

### Panel Members

- [Shoji Asai \(University of Tokyo\)](#)
- [Amalia Ballarino \(CERN\)](#)
- [Tulika Bose \(Wisconsin\)](#)
- [Kyle Cranmer \(Wisconsin\)](#)
- [Francis-Yan Cyr-Racine \(New Mexico\)](#)
- [Sarah Demers \(Yale\)](#)
- [Cameron Geddes \(LBNL\)](#)
- [Yuri Gershtein \(Rutgers\)](#)
- [Karsten Heeger \(Yale\), Deputy Chair](#)
- [Beate Heinemann \(DESY\)](#)
- [JoAnne Hewett \(SLAC\) HEPAP chair, ex officio](#)
- [Patrick Huber \(Virginia Tech\)](#)
- [Kendall Mahn \(Michigan State\)](#)
- [Rachel Mandelbaum \(Carnegie Mellon\)](#)
- [Jelena Maricic \(Hawaii\)](#)
- [Petra Merkel \(Fermilab\)](#)
- [Christopher Monahan \(William & Mary\)](#)
- [Hitoshi Murayama \(Berkeley\), Chair](#)
- [Peter Onyisi \(Texas Austin\)](#)
- [Mark Palmer \(Brookhaven\)](#)
- [Tor Raubenheimer \(SLAC\)](#)
- [Mayly Sanchez \(Florida State\)](#)
- [Richard Schnee \(South Dakota School of Mines and Technology\)](#)
- [Seon-Hee \(Sunny\) Seo \(IBS Center for Underground Physics\)](#)
- [Jesse Thaler \(MIT\)](#)
- [Christos Touramanis \(Liverpool\)](#)
- [Abigail Vieregge \(Chicago\)](#)
- [Amanda Weinstein \(Iowa State\)](#)
- [Lindley Winslow \(MIT\)](#)
- [Tien-Tien Yu \(Oregon\)](#)
- [Bob Zwaska \(Fermilab\)](#)

# ILC Timeline

Prepared by a subgroup of Americas Linear Collider Committee

- Aligned with timeline from Tatsuya Nakada – to be presented to P5

- Discussed/updated with IDT/WG3



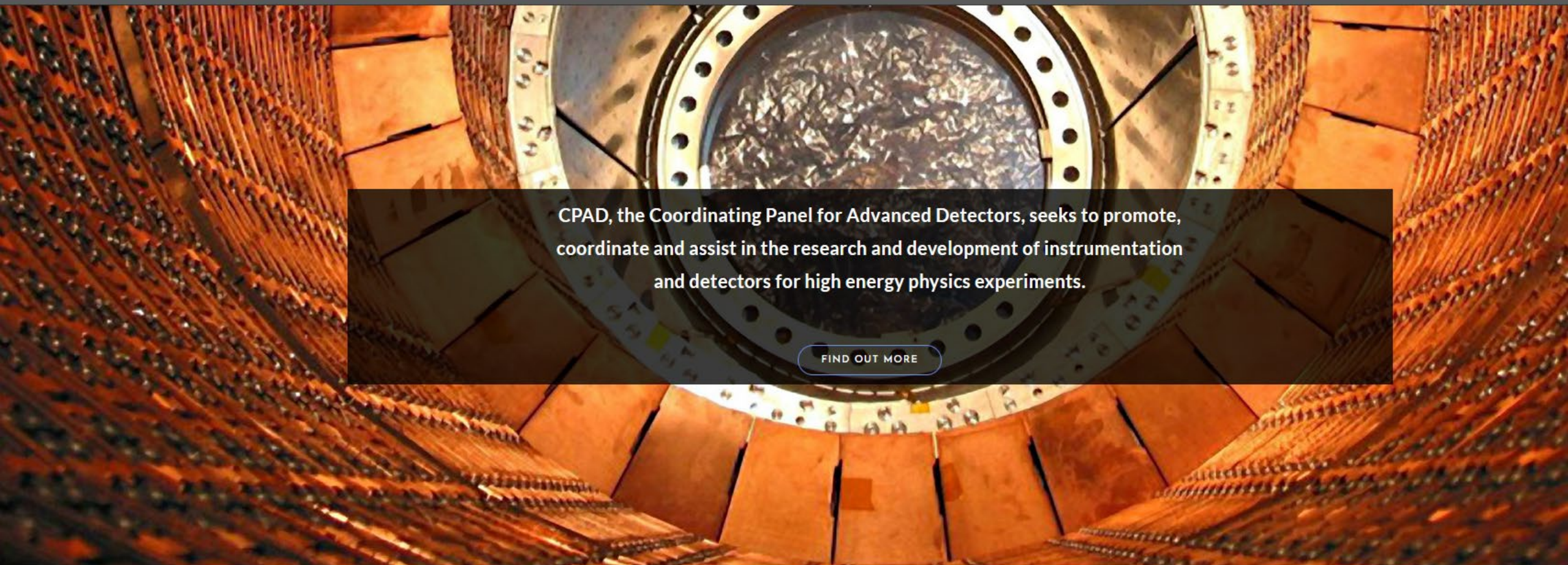
## Thoughts on Possible Detector Timeline

ALCC subgroup - 16 Mar 2023

Revised 28 Mar 2023 - IDT WG3

29 Mar 2023

- Q1 2024 - Q3 2030 - Detector R&D
  - R&D ramps up now since TDRs require 2 years effort, building on and during R&D,  
TDR starting Q3 2028.
- ~~Q3 2026 - Call for Detector EOIs by IDT~~
- **Q1 2027 - Formation of Preparatory Phase**
- Q1 2027 - Formation of ILCC
- Q1 2027 - Call for Detector LOIs - due by Q3 2027
- Q1 2028 - Q2 2028 Review of LOIs by ILCC
  - Down select of LOIs to proceed to TDR phase
- Q3 2028 - Initiate TDR efforts – to be completed Q3 2030
  - Detector R&D continues until Q3 2030
- **Q1 2030 - ILC Construction Begins**
- Q3 2030 - TDRs submitted at beginning of Q3
- Q3 2030 - Q4 2030 - Review of TDRs
- Q1 2031 - Start of detector component production
- Q1 2036 - Start of detector installation
- Q1 2039 - Start of integrated detector commissioning
- **Q1 2039 - ILC Commissioning starts**
- **Q1 2040 - First physics running**



CPAD, the Coordinating Panel for Advanced Detectors, seeks to promote, coordinate and assist in the research and development of instrumentation and detectors for high energy physics experiments.

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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. CPAD's representatives come from the national high-energy physics

Snowmass, P5, Detector R&D Update, A. White, CALICE meeting



# CPAD – Coordinating Panel for Advanced Detectors

## US R&D Collaborations

In a culmination of a decade of discussions within the US Detector Instrumentation community facilitated by CPAD, it has been decided at the last CPAD annual workshop to create a network of US Detector R&D Collaborations.

These Collaborations will be created covering major technology areas in line with the 2019 BRN. The goal is to bring together the community in a more persistent way than the annual CPAD workshops alone, to coordinate R&D efforts and to forge collaboration.

To this end, we have created the following mailing lists. Please sign up to your area of interest. Once we have the mailing lists filled, we will send around surveys to each to gauge everyone's specific interests with the goal to organize dedicated workshops and create work packages along the PRDs that were identified in the BRN.

(RDC1) Noble Element Detectors: [cpad\\_rdc1@fnal.gov](mailto:cpad_rdc1@fnal.gov)

(RDC2) Photodetectors: [cpad\\_rdc2@fnal.gov](mailto:cpad_rdc2@fnal.gov)

(RDC3) Solid State Tracking and Picosecond Timing: [cpad\\_rdc3@fnal.gov](mailto:cpad_rdc3@fnal.gov)

(RDC4) Readout and ASICs: [cpad\\_rdc4@fnal.gov](mailto:cpad_rdc4@fnal.gov)

(RDC5) Trigger and DAQ: [cpad\\_rdc5@fnal.gov](mailto:cpad_rdc5@fnal.gov)

(RDC6) Gaseous Detectors: [cpad\\_rdc6@fnal.gov](mailto:cpad_rdc6@fnal.gov)

(RDC7) Low-Background Detectors: [cpad\\_rdc7@fnal.gov](mailto:cpad_rdc7@fnal.gov)

(RDC8) Quantum and Superconducting Sensors: [cpad\\_rdc8@fnal.gov](mailto:cpad_rdc8@fnal.gov)

(RDC9) Calorimetry: [cpad\\_rdc9@fnal.gov](mailto:cpad_rdc9@fnal.gov)

# CPAD – Coordinating Panel for Advanced Detectors

**The goal for these R&D Collaborations is threefold:**

1. Create a strong R&D program towards the technologies needed to enable discoveries in future HEP detectors and foster innovation in instrumentation.
2. Allow for more streamlined and better organized collaboration between different university and lab groups in the US who are working on the same topics, to share expertise, tools and facilities, and to avoid duplication in light of limited funds.

Also take into account existing R&D efforts such as HEP-IC.

3. Facilitate easy communication and connections between these US Collaborations and the ECFA DRDs.

Sarah Eno, Marc-Andre Pleier and Jim Brau are the US contacts to ECFA TF6

# U.S. Department of Energy - Detector R&D

- Use guidance from 2019 Detector Basic Research Needs (BRN) report
- Welcome initiatives by interested labs to lay out the **directed R&D** needed for their favorite project.
- Welcome the initiative by CPAD to help organize broad, **generic R&D** efforts along the technology priorities identified in the HEP BRN.
- An appropriate balance and funding mechanisms need to be found for both types of effort.
- 
- Both types of effort need to proceed in close coordination/collaboration with each other and with the European DRDs so as to realize synergies while avoiding duplication of effort.