

News from the US Higgs Factory Community

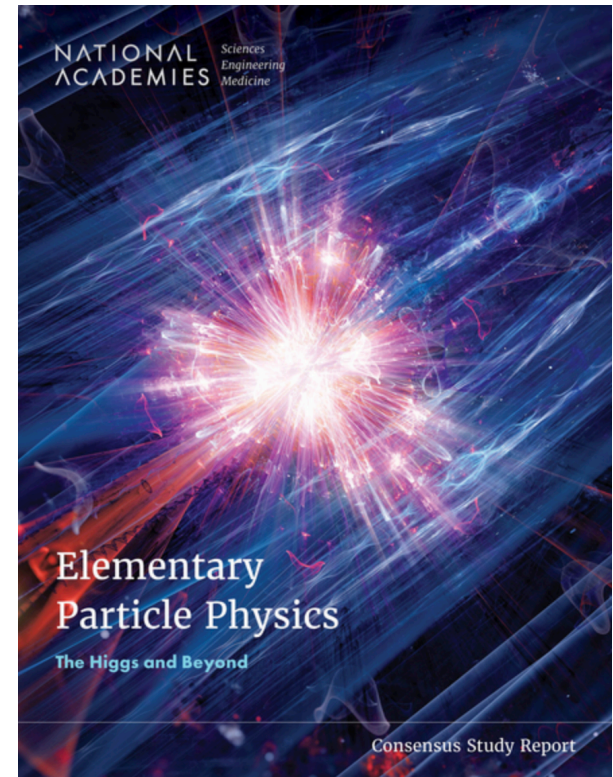
Julia Gonski

16 September 2025
IDEA Study Group Meeting



Recent US News

- Annual Higgs Factory meetings: 3rd annual meeting at Fermilab/Argonne [[14-17 April](#)]
- National Academy of Sciences “Elementary Particle Physics: Progress & Promise” report released [[11 June](#)]
 - “[Recommendation 1](#): The United States should host the world’s highest-energy elementary particle collider around the middle of the century. This requires the immediate creation of a **national muon collider R&D program...**”
 - “[Recommendation 2](#): The United States should **participate in the international Future Circular Collider Higgs factory** currently under study at CERN to unravel the physics of the Higgs boson.”
- FY26 funding requests placed to US Higgs Factory Coordinating Consortium ([HFCC](#))



Machine Learning for the Front End (ML4FE) Workshop

- University of Hawaii, 19-21 May
 - 77 participants, mix of physicists and engineers
 - Technology and physics applications, including colliders
- **Key R&D priorities to study in FCCee context:**
 - Heterogenous hardware and end-to-end DAQ optimization
 - 3D integration of “smart” electronics with advanced sensors
 - Advanced synthesis strategies for FPGAs (streaming, high-granularity quantization, etc.)
- Outcomes:
 - White paper on hardware-based machine learning (including quantum): drafting ongoing
 - Discussions ongoing to make it annual



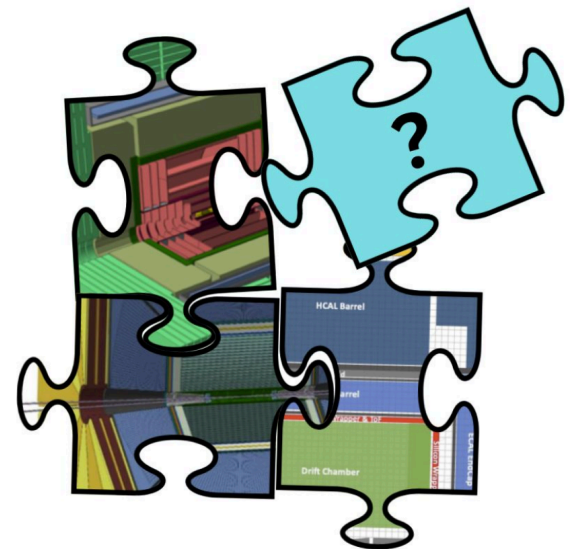
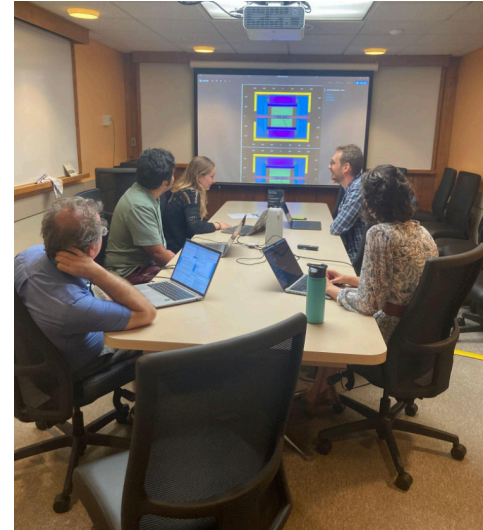
Edge, Heterogeneous, and Quantum Technologies for Hardware-based Machine Learning in Particle Physics

Abstract

The next generation of physics experiments, ranging from high-luminosity colliders to quantum sensing networks, will generate data at unprecedented volumes and rates. Harnessing this data for scientific discovery demands real-time decision-making, intelligent data reduction, and efficient processing architectures beyond current capabilities. Crucial to the success of this experimental paradigm are two technologies: machine learning (ML) and silicon microelectronics. Their intersection includes areas of research such as low-power and low-latency devices for edge computing, heterogeneous accelerator systems, reconfigurable hardware, cryogenic or high-radiation environments, and analog computing. This white paper presents a community-driven vision to identify and prioritize research and development opportunities in edge and heterogeneous ML hardware systems for physics applications, contributing towards a successful transition to the big data frontier of science.

FCC Hackathon/“Work” Workshop

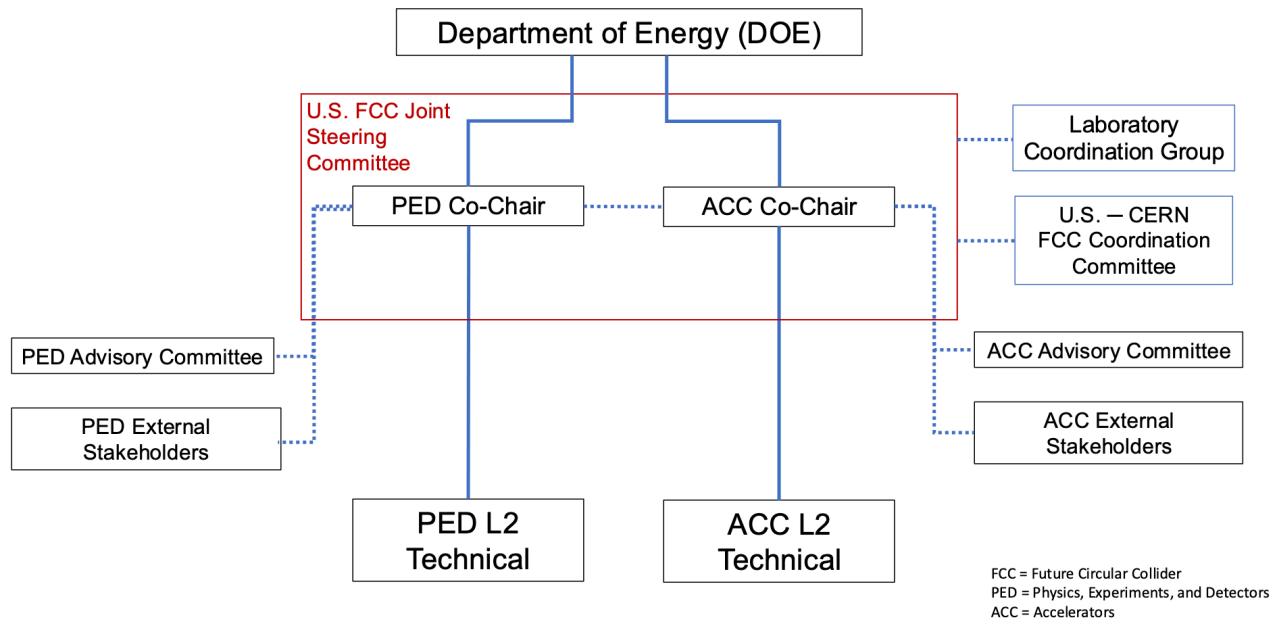
- BNL, 11-15 Aug
 - 43 participants, emphasis on getting early career people involved in US FCC
- **6 work packages**: ‘Pandora PFlow for ALLEGRO’, “Digitization in noble liquid calorimetry”, “HFCC Integration/Detector Concepts Design Challenge”, “CalVision”, “Tools for drift chamber design”, “Theory Challenges”
 - Need US community adept at generating/developing Key4HEP simulation
- Outcomes:
 - 2nd iteration planned for US FCC Workshop (fall 2026)
 - Large-scale goal of **HFCC AIM** (AI, Integration, Microelectronics): “detector design optimization challenge”



Update from US HFCC

- To reflect US and international prioritization emerging from EPPSU, focus US “off-shore Higgs Factory” effort highlighted by [P5](#) on **FCC**
 - Fully DOE funded (no NSF participation envisioned for at least 3 years)
 - P5 recommended “targeted panel” on accelerator program: will start to convene soon
 - More info in US monthly HFCC meeting [[4 Sept](#)]

U.S. Higgs Factory Circular Collider Organization (presented 9/4/2025)

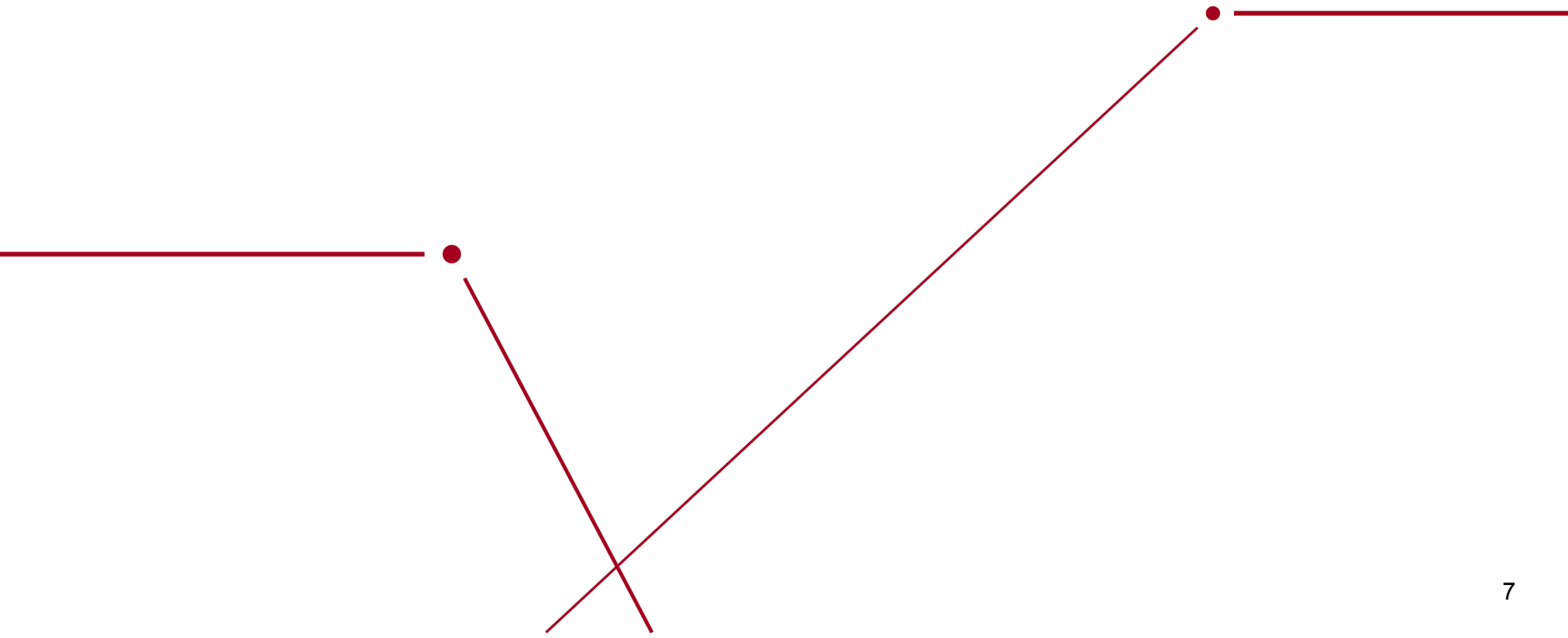


Conclusions & Next Steps

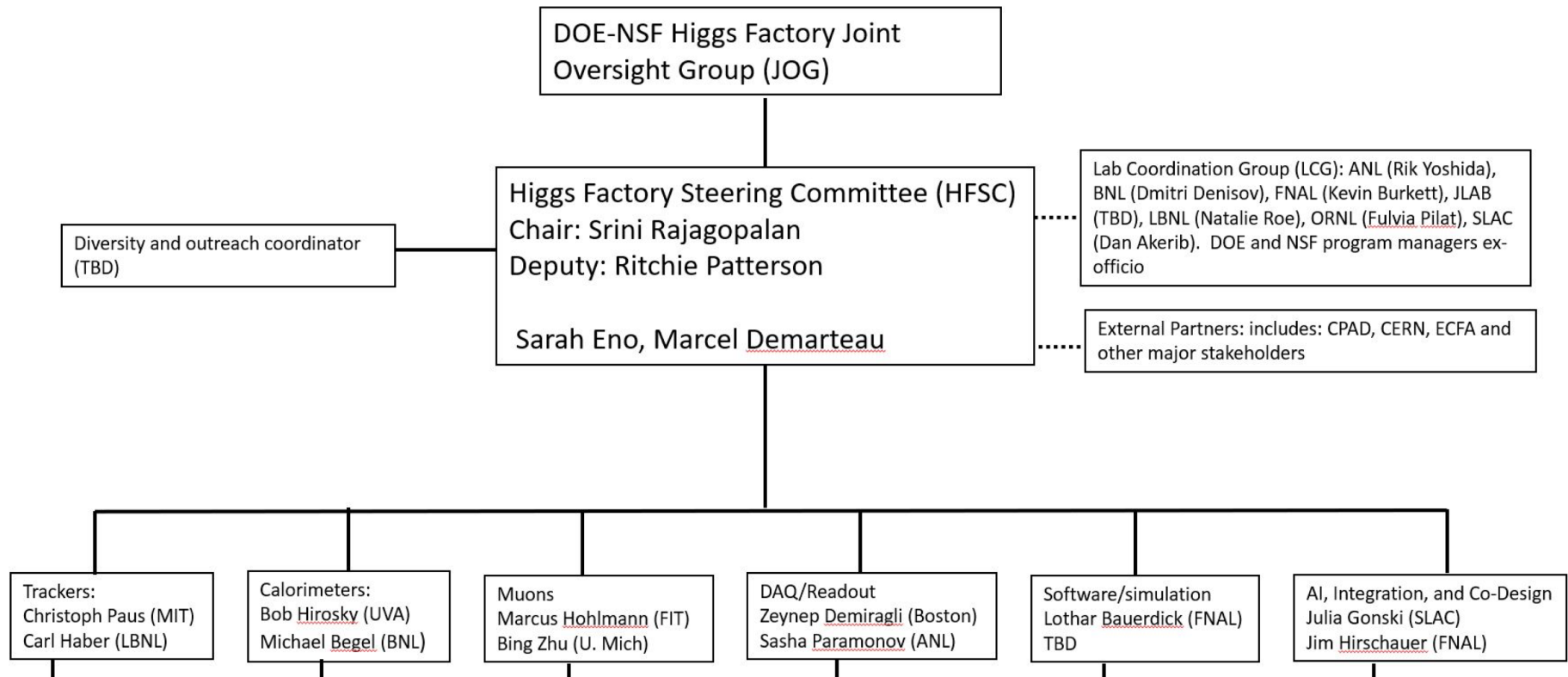
- Active US Higgs Factory effort in the US & growing!
 - Regular meetings, both community-wide and subsystem specific
 - “Off-shore Higgs Factory” from P5 now officially named as FCC from funding agencies
- Follow along:
 - Monthly HFCC [community meetings](#): first Thursdays at 6pm CET
 - Subscribe: US-HFCC at cern.ch



Backup



Old HFCC Organization Chart



AIM Detector Design Challenge

US HFCC: AI, Integrated Detector Concepts, & Microelectronics

L2 : Julia Gonski, Jim Hirschauer

L3 : Tim Andeen, Liza Brost, Jennet Dickinson, Loukas Gouskos



Community Detector Design/Optimization “Challenge”

Physics studies for full-detector concepts

- Goals for the “Challenge”:
 - Inspire the US community to contribute to **international efforts** for Integrated Detector physics studies
 - Lower the barrier to entry for new groups
 - Inspire new optimization and design ideas

