

US Plans Higgs Factory -Accelerators

Tor Raubenheimer (SLAC / Stanford – On leave)

FCC Week 2024, June 10, 2024

US-CERN Agreements

FCC Conceptual Design Study – activities under the 2015 DOE-CERN FCC Design Study agreement:

- Study to assess safety logistics in FCC tunnel – MOU signed between Fermilab and CERN in 2016
- Conceptual design of quadrupole magnets for high- and low-luminosity interaction regions – MOU signed between Fermilab and CERN in 2019
- Design study of electron-positron configuration of the FCC and development of magnet design for FCC-ee interaction region – MOU signed between BNL and CERN in 2020

FCC Feasibility Study – activities under the 2020 DOE-CERN FCC Feasibility Study agreement:

- Development of interaction magnet design and machine detector interface – MOU signed between BNL and CERN in 2024
- Engineering design study of FCC building technical and experimental surface sites – MOU between Fermilab and CERN in process; planned to be signed soon
- R&D studies of 800 MHz cryomodule – MOU between Fermilab and CERN in preparation

US – CERN Statement of Intent 2024

- Enhance collaboration in future planning activities for large-scale, resource-intensive facilities and continue collaboration on the FCC Feasibility Study



US Engagement in Accelerators for Higgs Factories

The US has had a long commitment to future Higgs Factories

- NLC/JLC in the 1990's
- ILC in the 2000's
- FCC-ee more recently

The 2023 P5 Report lays out a clear path for engagement in an “off-shore” Higgs Factory and US has a lot to contribute.

For examples see, May 3-5 2023, P5 Meeting at SLAC

- [ILC and SRF, Sergey Belomestnykh, et al](#)
- [FCCee, Vladimir Shiltsev](#)

Possible Contributions to FCC-ee R&D

US-FCCee Planning Panel Summary and "Ask" for the 2023 P5

US-FCCee Planning Panel

Panel Coordinators:

Tor Raubenheimer (SLAC/Stanford) and Vladimir Shiltsev (FNAL)

Machine Design:

Yunhai Cai (SLAC), John Byrd (ANL), Michiko Minty (BNL), Sergei Nagaitsev (JLab)

Magnet Systems:

Kathleen Amm (BNL), Steve Gourlay (FNAL), Soren Prestemon (LBNL)

RF Systems:

Sergey Belomestnykh (FNAL), Mark Kemp (SLAC), Matthias Liepe (Cornell)

With contributions from:

Michael Benedikt (CERN), Helen Durand (CERN), Eliana Gianfelice-Wendt (FNAL), Georg Hoffstaetter (Cornell), Vladimir Kashikhin (FNAL), Andy Lankford (UC Irvine), Emilio Nanni (SLAC/Stanford), Mark Palmer (BNL), Vittorio Parma (CERN), Franck Peauger (CERN), Srinu Rajagopalan (BNL), David Sagan (Cornell), Frank Zimmermann (CERN), Silvia Zorzetti (FNAL)

July 10, 2023

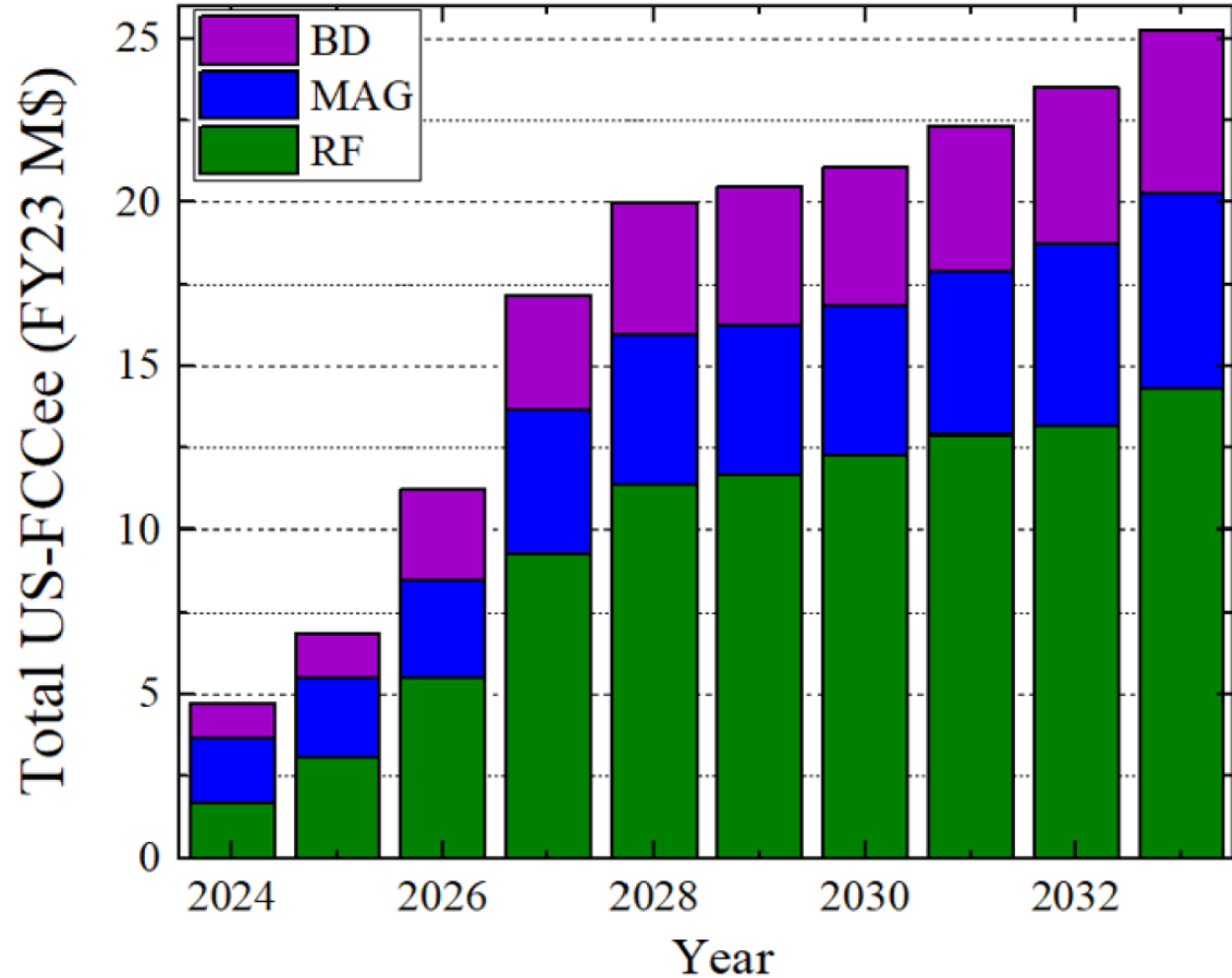


Figure 2: US FCC-ee pre-CD2 work cost estimates (FY23 \$).

Example: Superconducting RF

Fermilab, Cornell, and Jlab have expertise in high-Q bulk Nb SRF and cryomodule design. Goal: develop 800 MHz SRF for Booster and Main Rings pushing gradients and Q0

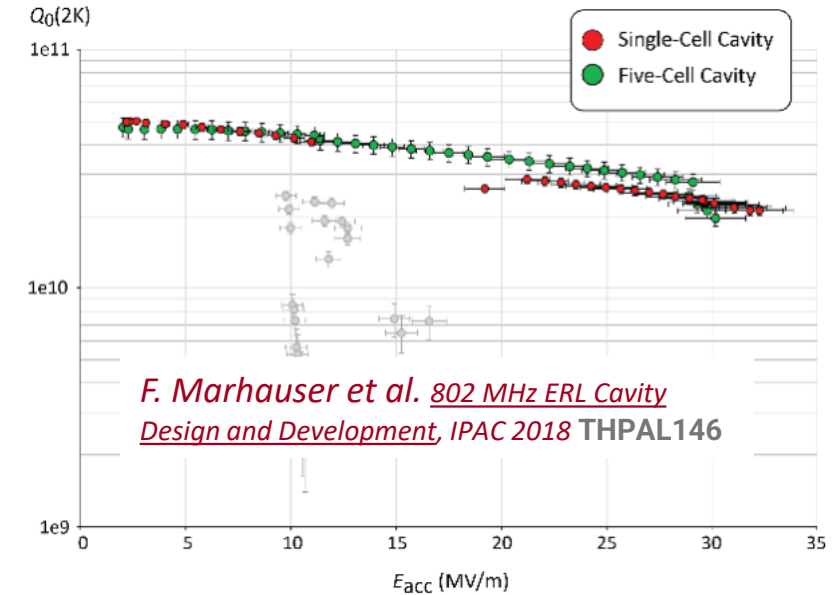
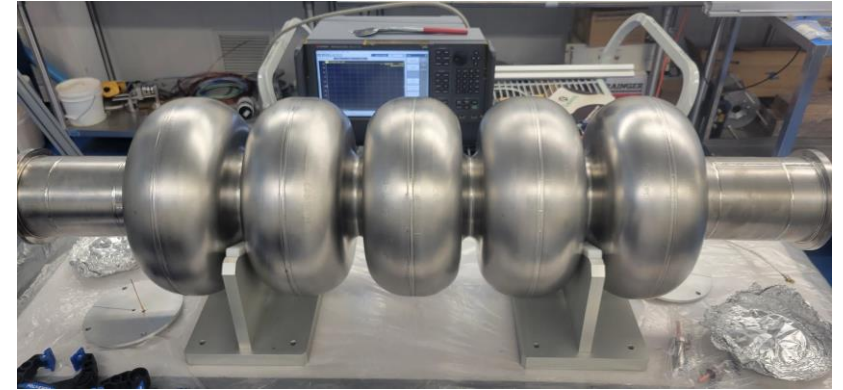
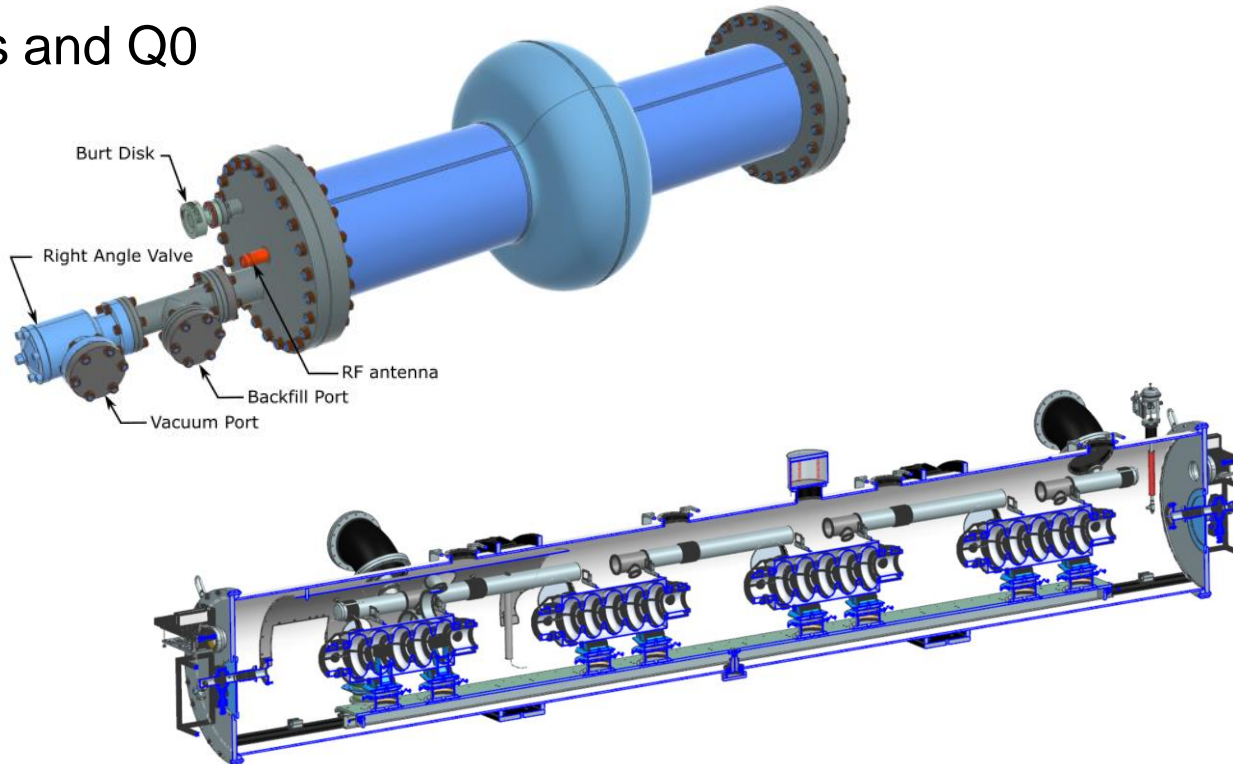
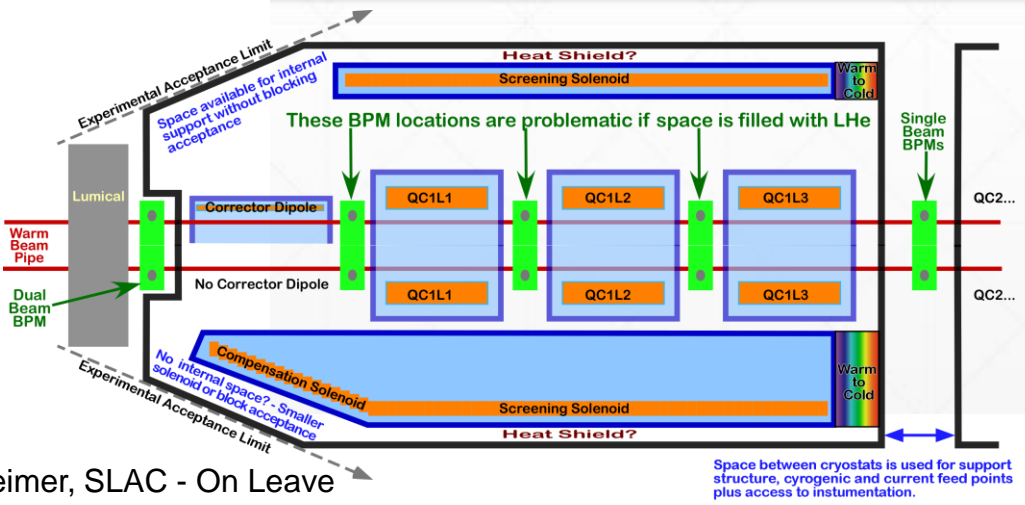
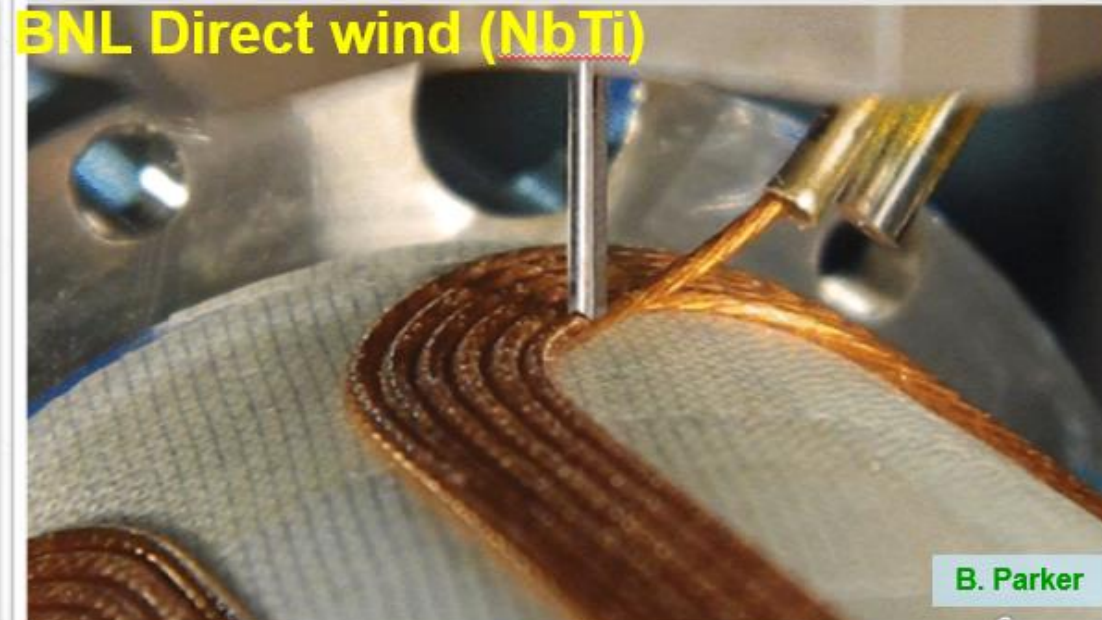


Figure 4: Combined VTA results for the five-cell and single-cell cavity as measured at 2 Kelvin.

Example: Machine-Detector Interface and IR Magnets

Fermilab and BNL have superconducting magnet expertise relevant for the IR quadrupoles and IR correction magnets



EIC-FCC Collaboration



FCC-EIC Joint & MDI Workshop 2022

17–28 Oct 2022
CERN
Europe/Zurich timezone

This extended two week working meeting combines the 1st FCC-EIC Joint Workshop and the MDI Workshop. The event will take place at CERN, from 17 to 28 October 2022 in an online participation format. The working meeting will start on Monday 17 October and end on Friday 28 October. It will be organized with presentations in the afternoon and discussions on various topics.

CERN FCC – EIC collaboration, contact persons - preliminary

Domain	CERN/FCC contacts	BNL/EIC contacts	JLAB/EIC contacts	Other contacts FCC	Other contacts EIC
impedance model, instabilities, HOM, ion instability	Mauro Migliorati (INFN), Ivan Karpov (CERN)	Mike Blaskiewicz, Alexei Blednykh, Silvia Verdu (?)	Todd Satogata	Alexander Novokhatski (SLAC)	
polarization	Jorg Wenninger (CERN), Jacqueline Keintzel (CERN)	Vadim Ptitsyn	Todd Satogata	Eliana Gianfelice (FNAL), Guy Wilkinson (Oxford)	
beam instrumentation, SR monitors (BPMs)	Thibaut Levefre (CERN), Manfred Wendt (CERN)	David Gassner, Dany Padrazo	Todd Satogata	Anke Susanne Mueller (KIT)	
beam feedback systems	Wolfgang Hofle (CERN)	Mike Blaskiewicz (BNL), Another ?	Todd Satogata	John Fox (SU)	
vacuum system	Roberto Kersevan, Cedric Garion (CERN)	Charles Hetzel	Mark Wiseman		
final focus quadrupoles		Brett Parker, Holger Witte	Walter Wittmer	Mike Koratzinos (MIT)	
SRF	Erk Jensen, Frank Gerigk, (CERN)	Kevin Smith	Robert Rimmer		
MDI, IR shielding, handling equipment associated with the IR	Manuela Boscolo (INFN), Helmut Burkhardt (CERN)	Holger Witte	Walter Wittmer	Mike Sullivan (SLAC)	
Collimation – beam tails	Andrey Abramov (CERN)			Dmitry Shatilov (BINP)	
Beam-beam interactions (limits with multiple IPs)	Xavier Buffat (CERN)			Dmitry Shatilov (BINP)	

First Annual U.S. Future Circular Collider (FCC) Workshop 2023

Hosted by Brookhaven National Laboratory
April 24–26, 2023



- [Home](#)
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Motivation

This workshop aims to better organize the FCC-ee community within the US and identify the most important and feasible areas of research to enable optimal FCC-ee accelerator, detectors and physics output by leveraging our domestic expertise. We will discuss the most needed elements and venues of FCC research in the US that can benefit the anticipated "integrated future colliders R&D program." Outcomes of this workshop will provide input to the P5 discussions.

Evening Events

Registered participants are invited to attend the welcome reception at no cost and the no-host banquet dinner.

Welcome Reception

Physics Department (Bldg. 510), Large Seminar Room

Program Committee

- Anadi Canepa (FNAL)
- Sergei Chekanov (ANL)
- Regina Demina (University of Rochester)
- Sarah Eno (University of Maryland)

Second Annual U.S. Future Circular Collider (FCC) Workshop 2024

Mar 25 – 27, 2024
MIT
America/New_York timezone

Overview

- Values in physics at MIT
- Code of Conduct
- Call for Abstracts
- Timetable
- Classical Timetable
- Contribution List
- Registration
- Participant List
- Accommodations and Transport
- Payment



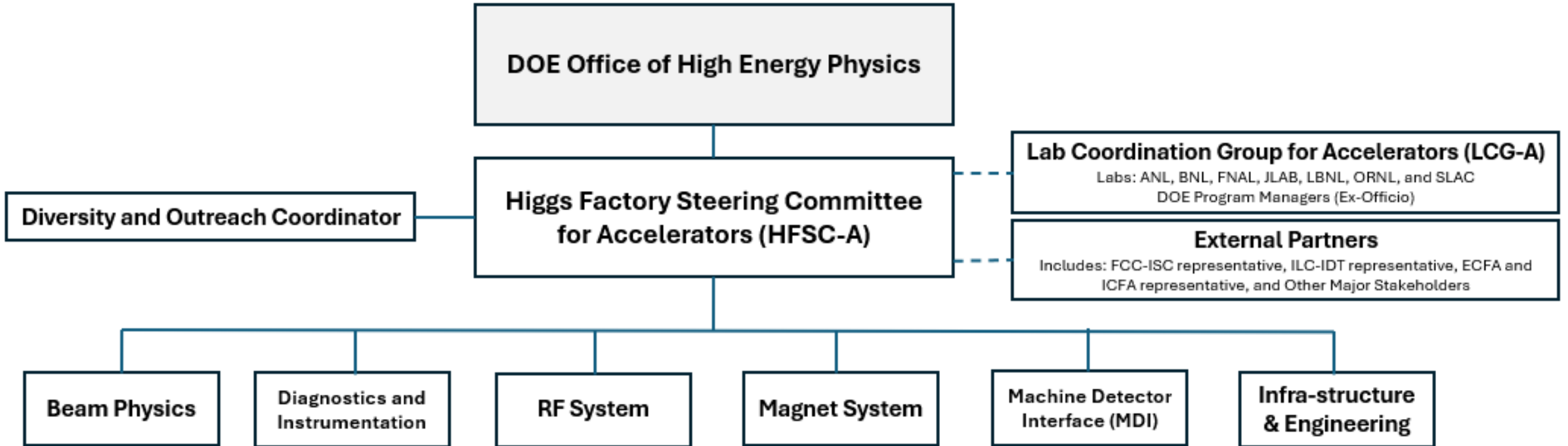
design by Jordan Lang

Overview

The annual US FCC workshop series started in 2023 at BNL with the idea of building and fostering the US community around the FCC and in particular the FCC-ee project. We will have the second instance of this workshop at MIT in Cambridge, MA.

US Higgs Factory Accelerator Program

U.S. Higgs Factory Coordination Consortium for Accelerators now being formed
Charge in preparation and to be released soon by DOE



Next Steps

- Develop the organization in the US with a charge – available soon!
- Work with FCC and ILC managements to understand R&D opportunities
- Work with DOE HEP on future funding support for accelerator activities

- Immediate goal is to complete the FCC Feasibility Study
- Longer-term goal is to develop R&D program, including undertaking pre-project R&D, leveraging unique capabilities that support and advance FCC

- Announcements will be made as the organization is put together!