

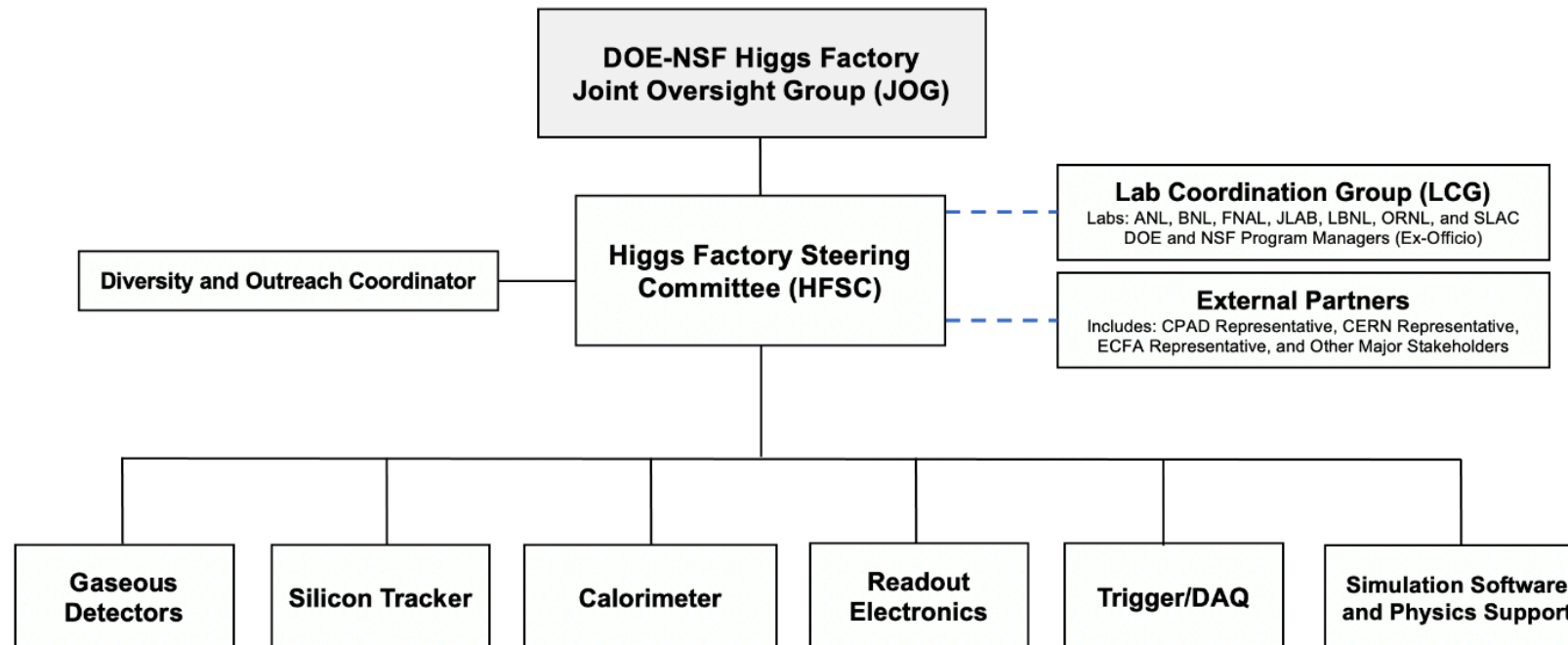
Higgs Factory LCG Meeting

12 Aug. 2024

M. Demarteau, S. Eno, R. Patterson, S. Rajagopalan

DOE/NSF response to P5 recommendation

- ❖ Constructive engagement with DOE & NSF following the release of the P5 report.
- ❖ A national Higgs Factory Coordination Consortium (HFCC) has been formed by DOE & NSF
 - ❖ Provide strategic direction and leadership for the U.S. community to engage, shape and thereby advance the development of physics, experiment and detector program for a potential future Higgs factory and to ensure cooperation with our partners in the international program.



Charge (Physics, Experiments & Detectors), 5/28/2024

1. **Physics and technical feasibility studies**, including any associated design and R&D efforts, to **advance various experiment detector concepts** at a future Higgs factory;
 2. **Prioritization and stewardship** of the national R&D efforts should funds be identified by DOE and/or NSF;
 3. **Development of the pre-project detector R&D scope** that will be required prior to DOE and/or NSF initiating any detector project at a future e+e- collider;
 4. Conceptualization of the **software and computing framework** that will be needed to advance physics studies and R&D efforts; and to collect, store, and analyze the large volumes of physics data at future collider experiments;
 5. In consultation with DOE and NSF program managers, **develop various funding models** that will be required to support the R&D efforts described in items (3) and (4) above; and
 6. **Ensure collaborations** by the U.S. with our partners are cost-effectively carried out to advance the future Higgs factory initiatives. (CPAD, ECFA, DRD, others).
- Prepare the groundwork to respond to the P5 Recommendation 6a: “[Convene a targeted panel to review] the level and nature of US contribution in a specific Higgs factory including an evaluation of the associated schedule, budget, and risks once crucial information becomes available”

Appointments

- Higgs Factory Steering Committee (HFSC) composition:
 - Marcel Demarteau (ORNL)
 - Sarah Eno (Maryland)
 - Ritchie Patterson (Cornell); Deputy chair and NSF contact
 - Srimi Rajagopalan (BNL); Chair and DOE contact
- Lab Coordination Group (LCG) composition:
 - ANL: Rik Yoshida
 - BNL: Dmitri Denisov
 - FNAL: Kevin Burkett
 - JLAB: TBC
 - ORNL: Fulvia Pilat
 - LBNL: Natalie Roe
 - SLAC: Dan Akerib

Reminder of the P5 process:

- Community driven coordinated effort to outline the potential U.S. scope in detector R&D for future Higgs Factories
 - Solid State: A. Apresyan, C. Haber, C. Vernieri
 - Calorimeter: H. Chen, C. Tully, A. White
 - Gaseous Detector: M. Hohlmann, G. Iakovidis, B. Zhou
 - Readout/ASICs: J. Gonski, J. Hirshchauer
 - Trigger/DAQ: Z. Demiragli, J. Zhang
 - Particle ID: M. Artuso, G. Wilson, Z. Ye
 - Quantum: M. Demarteau, C. Pena, S. Xie
 - Software: H. Gray, O. Gutsche, J. Strube
 - ex-officios: J. Brau, A. Canepa, D. Denisov, S. Eno, P. Grannis, K. Jakobs, A. Lankford
 - plus representation from DOE and CPAD.
 - Chair: S. Rajagopalan
- Documented prioritized scope and ask, submitted to P5 <https://arxiv.org/abs/2306.13567>
- A big thanks to all the people involved in the Snowmass and the P5 process.

FY24

- ❖ The coordination group, responsible for outlining the P5 process, also defined the set of critical activities that require immediate support in FY24.
- ❖ Following the successful P5 process, DOE authorized \$0.5M in support of FY24 R&D.
- ❖ The following **FY24** activities were subsequently approved and funded:

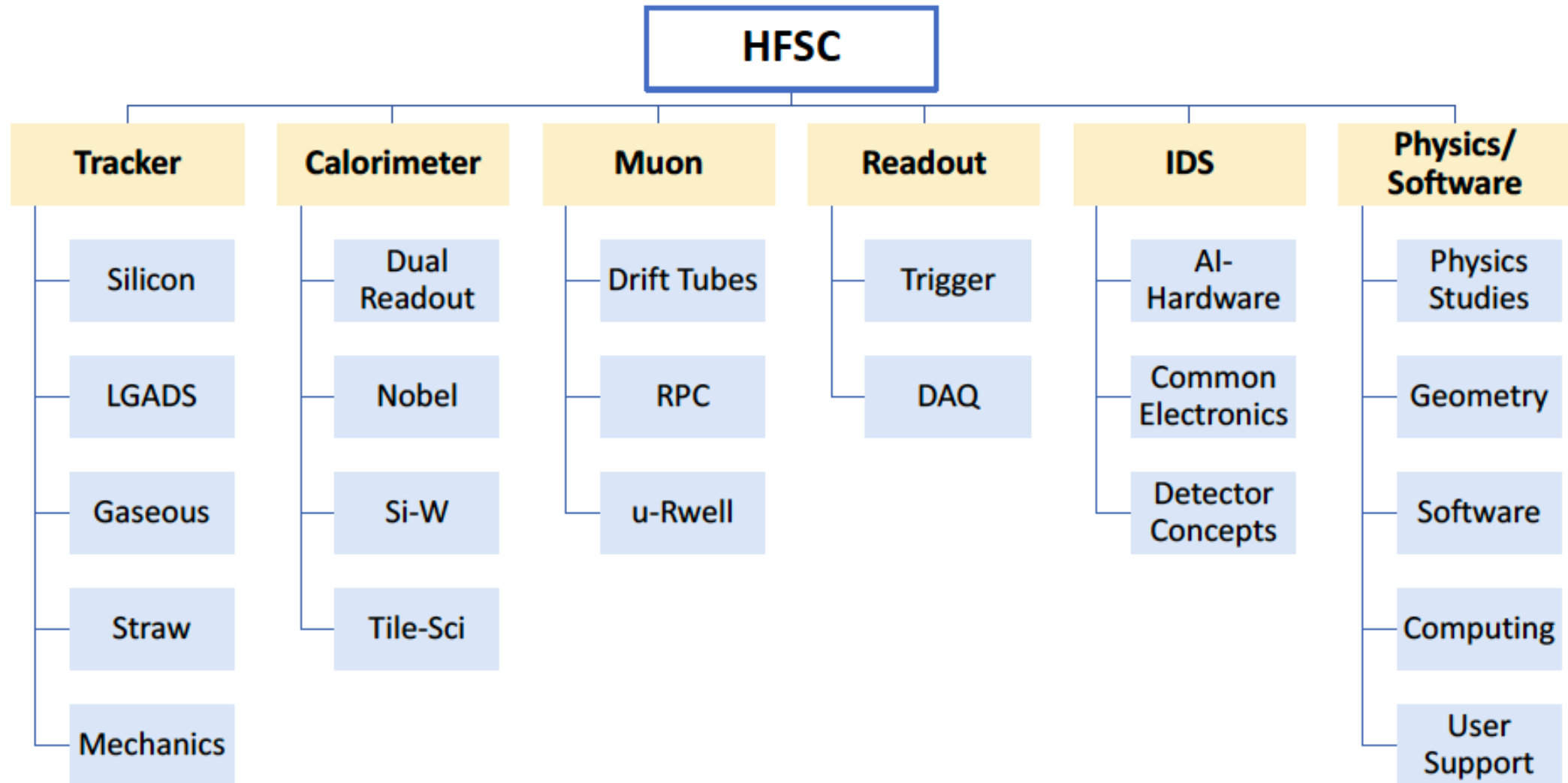
MAPS (Napa p2 development)	SLAC
Design of test structures for testing MAPS	FNAL
TCAD simulations	FNAL
Setup to study gas mixtures for straw tubes	Michigan
Purchase of wires for gaseous tracker R&D	BNL
Investigation of eco-friendly gases	FIT
Design for integration of cold electronics in LAr demonstrator modules	BNL
Study of low power 28nm TDC	Amherst
Key4HEP software development	Princeton

- ❖ Moving forward, we intend to have a well-defined bottom-up process to allocate funding
 - ❖ similar to the prioritization of scope in ATLAS and CMS.
 - ❖ **Warning: very limited budget, if any, expected for FY25.**

Updated organization

- Combined Gaseous Tracker and Silicon based Tracker → Tracker
 - Strong desire to coordinate the “tracking’ efforts as an integrated system.
- Front-end electronics associated with a specific detector systems are the responsibility of that respective group.
- New Group created: IDS = Integrated Detector Systems
 - To emphasize the need to explore and develop AI driven hardware across all detector systems
 - As well as study and pursue options for integrated detector concepts.
- L3 structure further developed
- L2 and L3 coordinators will soon be appointed, we should have the organization in place by the end of August.
 - L2/L3 will reach out and engage with U.S. institutes (based on the interests expressed in the EOIs that were collected earlier).

Updated L2/L3 Structure



Role of the L2/L3 coordinators

- Engage the U.S. community
 - Recently collected EOIs identified the interests of the U.S. institutes.
 - Regular meetings with community to define and prioritize the U.S. scope.
 - Oversee the U.S. effort to meet the respective objectives and milestones.
- Engage the external partners
 - Coordinate the efforts with the respective DRD coordinators to lay out a unique and cost-effective U.S. scope that relies on the U.S. strengths.
 - Collaborate and work with the international partners.
 - Collaborate and communicate with CPAD/RDC and DRD groups.
- Report to the HFSC
 - Define, prioritize and justify scope and seek appropriate funding.
 - Contribute to the U.S. input to the European Strategy Feasibility studies.
- We expect the L2/L3 to work as a team and report regularly to the HFSC.

Appointment process

- Propose two co-coordinators for each L2 and one coordinator for each L3.
- Call for nominations sent out covering both L2 and L3.
 - We have received ~50 nominations.. Thanks for the active engagement.
- Consulted some experts in community for input
 - In particular, with HL-LHC managers, to ensure candidates did not have other critical responsibilities.
- We have carefully considered the candidates to ensure
 - Interest and experience of the candidate to oversee the effort
 - Diversity, especially engage early career where possible
 - National laboratories are engaged
 - Both ATLAS and CMS communities are well represented
 - Both Labs and Universities are represented, pairing Lab-Univ coordinators for each L2 where-ever possible.

European Strategy

- Timeline for the next update to the European Strategy: June 2026.
- Scientific secretary to the European Strategy appointed (K. Jakobs)
- Detailed [presentation](#) from K. Jakobs at recent LCWS.

*In June 2024, the CERN Council established and approved the **remit of the European Strategy Group***

*”The aim of the Strategy update should be to develop a **visionary and concrete plan** that greatly advances human knowledge in fundamental physics through the **realisation of the next flagship project at CERN**. This plan should attract and value **international collaboration** and should **allow Europe to continue to play a leading role in the field.**”*

Timeline

September 2024 Council

Council appointment of the members of the PPG

December 2024 Council

Council decision on the **venues for the Open Symposium** and the **Strategy Drafting Session**

Call for proposals to host these events have gone out;
Dates of both events have been fixed

31 March 2025

Deadline for the submission of input from the community

23 – 27 June 2025

Open Symposium

End of September 2025

Submission of the “Briefing Book” to the ESG

01 – 05 December 2025

Strategy Drafting Session

End January 2026

Submission of the Draft Strategy Document to the Council for feedback

March-June 2026 Council Sessions

Discussion of the Draft Strategy Document by the Council followed by the updating of the Strategy by the Council.

(i) Submission of input from the community by 31 March 2025

Input from projects (FCC, CLIC, ..., Muon Collider, ..., theory, ...) expected
Input from national communities expected (process has already started in several countries)
....

→ Key input will become available only at that time

- * Final report on FCC feasibility study (including progress on financial feasibility)
- * Important input from alternative projects
- * Reports on accelerator R&D, detector R&D, ...
- * ...



Input to European Strategy

- The HFSC will coordinate the efforts to prepare the input to ESPP, including on the potential scope of the U.S. participation in an off-shore Higgs Factory located at CERN.
 - Will be a bottom-up community driven process
 - L2/L3 coordinators will play a significant role in collecting and prioritizing technical inputs for this document.
 - We are coordinating with international partners, in particular the member states.
 - We will continue to engage the LCG, DOE/NSF and the U.S. community as this process develops.
 - Deadline for submission is 3/31/2025.

Next Steps

- Appoint L2/L3 coordinators
 - HFSC will engage the L2/L3 coordinators and the external partners through regularly held HFCC coordination meetings.
- L2/L3 coordinators call a U.S. community meeting to discuss process, and layout the scope.
 - Initial set of U.S. EOI collected earlier this year identify the interests of the U.S. institutes and will be a starting point for L2/L3 to identify and engage the interested institutes.
 - Open process, additional institutes would be welcome to join.
 - Appropriate open mailing lists/web pages to facilitate communication.
- Define the FY25 scope and prioritize, allocate funding withing DOE guidance.
- Reach out to the DRD to discuss the U.S. efforts on detector R&D.
- Prepare for input to ESPP.