European Workshop on CEPC

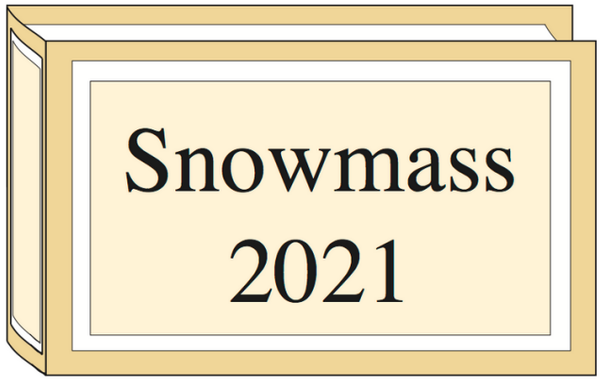
July 6, 2023

Tao Han

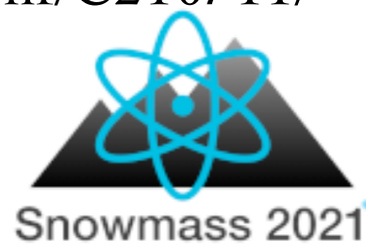
Pitt PACC

University of Pittsburgh

Thank you for inviting me to the important panel!



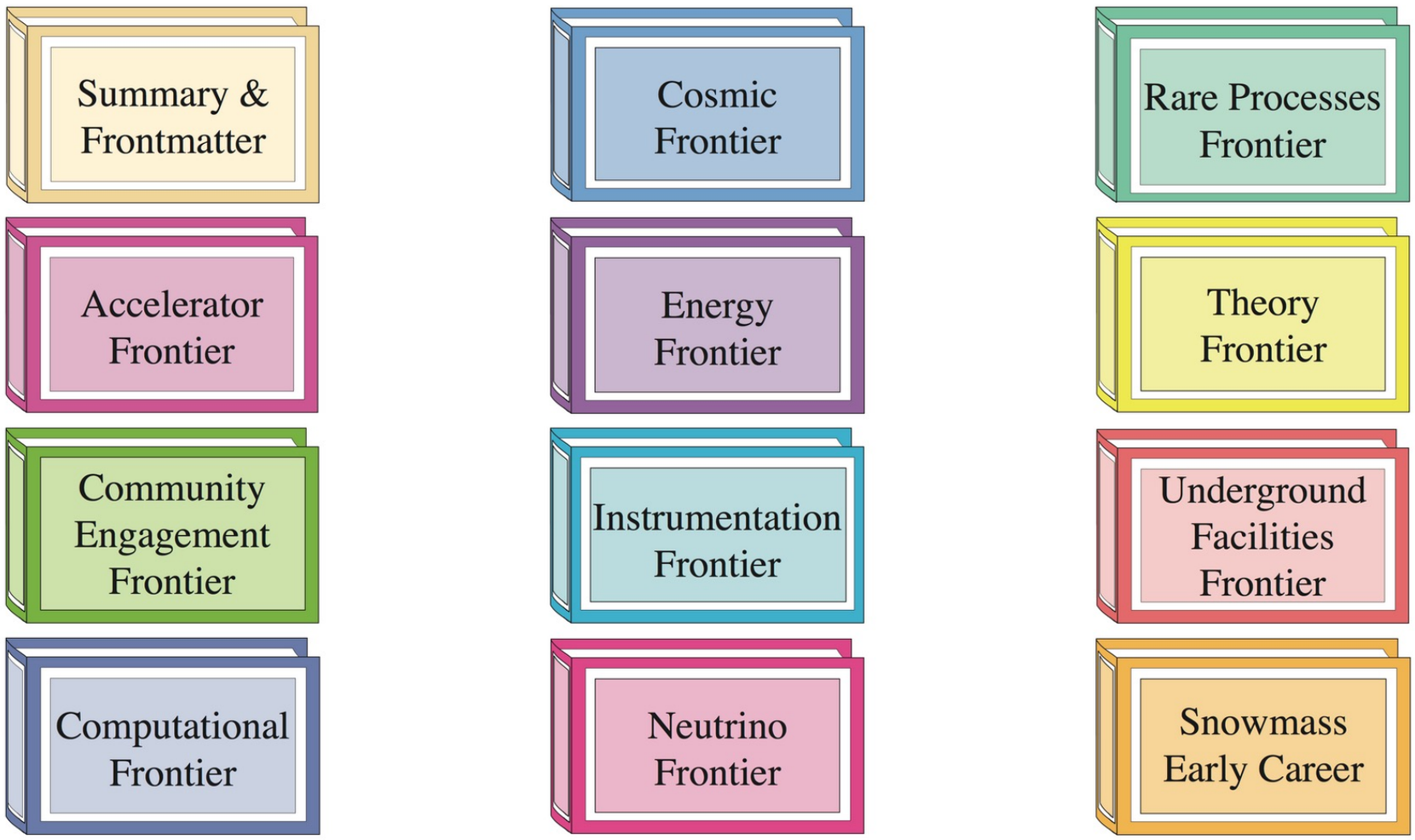
https://www.slac.stanford.edu/econf/C210711/



Proceedings of the 2021 US Community Study on the Future of Particle Physics

(Snowmass 2021)

organized by the APS Division of Particles and Fields



Snowmass 2021 Executive Summary in EF:

(Energy Frontier Report: arXiv:2212.11084)

The EF supports **continued strong US participation in the success of the LHC, and the HL-LHC** construction, operations, computing and software, and most importantly in the physics research programs, including auxiliary experiments.

The EF supports a **fast start for construction of an e+e– Higgs factory** (linear or circular), **and a significant R&D program for multi-TeV colliders** (hadron and muon). The realization of a Higgs factory will require an immediate, vigorous, and targeted detector R&D program, while the study towards multi-TeV colliders will need significant and long-term investments in a broad spectrum of R&D programs for accelerators and detectors.

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.

Snowmass 2021 EF Scenarios:

(Collider Implementation Task Force arXiv:2208-06030)

Higgs factories:

Collider	Type	$\sqrt{s}$	$\mathcal{P}$[%] e^-/e^+	$\mathcal{L}_{\text{int}}$ ab^{-1}/IP	Start Date Const.	Physics
HL-LHC	pp	14 TeV		3		2027
ILC & C^3	ee	250 GeV	$\pm 80/\pm 30$	2	2028	2038
		350 GeV	$\pm 80/\pm 30$	0.2		
		500 GeV	$\pm 80/\pm 30$	4		
		1 TeV	$\pm 80/\pm 20$	8		
CEPC	ee	M_Z		50	2026	2035
		$2M_W$		3		
		240 GeV		10		
		360 GeV		0.5		
FCC-ee	ee	M_Z		75	2033	2048
		$2M_W$		5		
		240 GeV		2.5		
		2 M_{top}		0.8		
μ-collider	$\mu\mu$	125 GeV		0.02		

New frontier @ multi-TeV

Collider	Type	$\sqrt{s}$	$\mathcal{P}$[%] . e^-/e^+	$\mathcal{L}_{\text{int}}$ ab^{-1}/IP	Start Date Const.	Physics
FCC-hh	pp	100 TeV		30	2063	2074
SppC	pp	75-125 TeV		10-20		2055
CLIC	ee	1.5 TeV	$\pm 80/0$	2.5	2052	2058
		3.0 TeV	$\pm 80/0$	5		
μ-collider	$\mu\mu$	3 TeV		1	2038	2045
		10 TeV		10		

- **Complete the HL-LHC program,**
- **Start now a targeted program for detector R&D for Higgs Factories**
- **Support a fast start of the construction of a Higgs factory**
- **Ensure the long-term viability of the field by developing a multi-TeV energy frontier facility such as a *muon collider* or a *hadron collider*.**

EF Resources and Timelines

- **Five year period starting in 2025**
  - Prioritize *HL-LHC physics program,* including auxiliary experiments
  - Establish a targeted e^+e^- *Higgs Factory detector R&D* for US participation in a global collider
  - Develop an *initial design for a first stage TeV-scale Muon Coll.* in the US (pre-CDR)
  - Support critical *detector R&D towards EF multi-TeV colliders*
- **Five year period starting in 2030**
  - Continue strong support for *HL-LHC program*
  - Support and advance *construction of an e+e- Higgs Factory*
  - Demonstrate principal risk mitigation and deliver *CDR for a first-stage TeV-scale Muon Coll.*
- **After 2035**
  - Support continuing *HL-LHC physics program* to the conclusion of archival measurements
  - Begin and support the *physics program of the Higgs Factories*
  - Demonstrate readiness to construct and deliver *TDR for a first-stage TeV-scale Muon Coll.*
  - Ramp up funding support for *detector R&D for EF multi-TeV colliders*