Introduction: Snowmass 2021

Frontier for Rare Processes and Precision Measurements

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Snowmass 2021

- The Particle Physics Community Planning Exercise (a.k.a. “Snowmass”) is organized by the Division of Particles and Fields (DPF) of the American Physical Society.
- Snowmass is an opportunity for the entire HEP community to come together to identify and document a vision for the future of particle physics in the U.S. and its international partners.
  - Snowmass is a science study exercise and the outcome is a report on the progress and opportunities for science in the next 10 years
  - This report will serve as an input to the Particle Physics Project Prioritization Panel (P5), whose role is to formulate a 10 year plan for the US science program within funding constraints.
- Given the increasing importance of interdisciplinary work in related fields such as astrophysics, cosmology, nuclear physics, etc., members of other Divisions (Astrophysics, Gravitational Physics, Nuclear Physics, Physics of Beams etc.) with a connections to particle physics are strongly encouraged to participate in this process.

Rare Processes and Precision Measurements

- The Frontier for Rare Processes and Precision Measurements explores fundamental physics with intense sources and ultra-sensitive detectors.

Topical groups

- RF1: Weak decays of b and c quarks
- RF2: Weak decays of strange and light quarks
- RF3: Fundamental Physics in Small Experiments
- RF4: Baryon and Lepton Number Violating Processes
- RF5: Charged Lepton Flavor Violation (electrons, muons and taus)
- RF6: Dark Sector Studies at High Intensities
- RF7: Hadronic Spectroscopy

- Wiki page: https://snowmass21.org/rare/

Rare Processes and Precision Measurements

- The Frontier for Rare Processes and Precision Measurements explores fundamental physics with intense sources and ultra-sensitive detectors.

Topical Conveners:

- Weak Decays of b and c quarks: Angelo Di Canto/Stefan Meinel
- Weak Decays of strange and light Quarks: Evgueni Goudzovski/Emilie Passemar
- Fundamental Physics in Small Experiments: Peter Winter/Tom Blum
- Baryon and Lepton Number Violation: Pavel Fileviez Perez/Andrea Pocar
- Charged Lepton Flavor Violation: Bertrand Echenard/Sacha Davidson
- Dark Sector at High Intensities: Mike Williams/Stefania Gori
- Hadronic Spectroscopy: Tomasz Skwarnicki/Richard Lebed

- Wiki page: https://snowmass21.org/rare/

This is a group effort!

Liaisons to other frontiers

Role: ensure information/facilitate discussion on frontier activities on items of common interest

	Frontier	Co-Conveners		
Angelo Di Canto	Energy Frontier	Meenakshi Narain	Brown University	meenakshi_narain@brown.edu
		Laura Reina	Florida State University	reina@hep.fsu.edu
		Alessandro Tricoli	Brookhaven National Laboratory	atricoli@bnl.gov
Bob Bernstein	Frontiers in Neutrino Physics	Patrick Huber	Virginia Tech	pahuber@vt.edu
		Kate Scholberg	Duke University	schol@phy.duke.edu
		Elizabeth Worcester	Brookhaven National Laboratory	etw@bnl.gov
	Frontier in rare processes and Precision measurements	Marina Artuso	Syracuse University	martuso@syr.edu
		Bob Bernstein	Fermi National Accelerator Laboratory	rhbob@fnal.gov
		Alexey Petrov	Wayne State University	apetrov@physics.wayne.edu
Susan Gardner	Cosmic Frontier	Aaron Chou	Fermi National Accelerator Laboratory	achou@fnal.gov
		Marcelle Soares Santos	Brandeis University	marcelle@brandeis.edu
		Tim Tait	University of California, Irvine	ttait@uci.edu
Alexey Petrov	Theory Frontier	Nathanial Craig	University of California, Santa Barbara	ncraig@physics.ucsb.edu
		Csaba Csaki	Cornell University	csaki@cornell.edu
		Aida El-Khadra	University of Illinois, Urbana-Champaign	axk@illinois.edu
Bob Bernstein	Accelerator Science and Technology Frontier	Steve Gourlay	Lawrence Berkeley National Laboratory	sagourlay@lbl.gov
		Tor Raubenheimer	SLAC National Accelerator Laboratory	tor@slac.stanford.edu
		Vladimir Shiltsev	Fermi National Accelerator Laboratory	shiltsev@fnal.gov
Marina Artuso	Instrumentation Frontier	Phil Barbeau	Duke University	psbarbeau@phy.duke.edu
		Petra Merkel	Fermi National Accelerator Laboratory	petra@fnal.gov
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Stefan Meinel	Computational Frontier	Steve Gottlieb	Indiana University	sg@indiana.edu
		Oliver Gutsche	Fermi National Accelerator Laboratory	gutsche@fnal.gov
		Ben Nachman	Lawrence Berkeley National Laboratory	bpnachman@lbl.gov
	Underground Facilities and Infrastructure	Jeter Hall	SNOLAB	Jeter.Hall@snolab.ca
		Kevin Lesko	Lawrence Berkeley National Laboratory	ktlesko@lbl.gov
		John Orrell	Pacific Northwest National Laboratory	john.orrell@pnnl.gov
Sophie Middleton	Community Involvement	Ketevi Assamagan	Brookhaven National Laboratory	ketevi@bnl.gov
		Breese Quinn	University of Mississippi	quinn@phy.olemiss.edu

Road Map for R&P Frontier

- Elucidate the case for the physics program that we are engaged in
  - Practical aspects: develop a program of workshops, open up slack conversation, formalize joint studies to sharpen the physics case with scenarios on how we will achieve our physics goals in the medium and long-term future
  - Develop milestones [in coordination with MA, RB & AP]
- Methodology: identify key measurements, theoretical approaches needed to relate measurements to fundamental physics (e.g. lattice QCD...), bottom up and top down interpretation tools
- Gather a strong community to advocate for this physics program
  - Invite participation to slack channels, listservs and workshops, solicit LOIs
  - Find connection with other communities
  - Build network with other frontiers (physics groups, computing, instrumentation, accelerator, social engagement)
  - Identify cross-sectional physics interest
  - Identify common instrumentation, computing/infrastructure need

Your input

Letters of Interest (submission period: April 1, 2020 – August 31, 2020)

Letters of interest allow Snowmass conveners to see what proposals to expect and to encourage the community to begin studying them. They will help conveners to prepare the Snowmass Planning Meeting that will take place on November 4 - 6, 2020 at Fermilab. Letters should give brief descriptions of the proposal and cite the relevant papers to study. Instructions for submitting letters are available at https://snowmass21.org/loi. Authors of the letters are encouraged to submit a full writeup for their work as a contributed paper.

Contributed Papers (submission period: April 1, 2020 – July 31, 2021)

Contributed papers will be part of the Snowmass proceedings. They may include white papers on specific scientific areas, technical articles presenting new results on relevant physics topics, and reasoned expressions of physics priorities, including those related to community involvement. These papers and discussions throughout the Snowmass process will help shape the long-term strategy of particle physics in the U.S. Contributed papers will remain part of the permanent record of Snowmass 2021. Instructions for submitting contributed papers are available at https://snowmass21.org/submissions/

Final Product: Snowmass 2021 Report

You do NOT need to submit LOI to submit Contributed Paper!

Timeline

- Summer 2020
  - R&P Kick-off Workshop (July 28): https://indico.fnal.gov/event/44121/
  - R&P Topical Group meetings/workshops (Zoom)
- Fall 2020
  - Snowmass Planning Meeting: October 5-7, 2020 (FNAL/Zoom)
- Winter 2021
  - R&P Topical Group meetings/workshops
- March 2021
  - R&P Frontier meeting (hopefully F2F or F2F/Zoom combination)
    - Site proposals: send them to AAP, MA, & BB!
- Summer 2021
  - 2021 Snowmass Summer Study: July 11-16, 2021 (UW Seattle)