Introduction to Snowmass 2021 for CLICdp

CLICdp General Meeting, 11 May 2020

Aidan Robson, Philipp Roloff, Lucie Linssen, Frank Simon

Snowmass

https://snowmass21.org/

US analogue to European Strategy, organised by APS/DPF

Snowmass is entirely community-driven; final report is used as input to funding policy through e.g. Particle Physics Project Prioritization Panel (P5), which goes through HEPAP to DoE and NSF.

Snowmass 2013 input

Snowmass last took place 2012/13; CLIC submitted two papers, plus presentations in town hall meetings and talks in key sessions

High Energy Physics - Experiment

https://arxiv.org/abs/1307.5288

[Submitted on 19 Jul 2013 (v1), last revised 30 Sep 2013 (this version, v3)]

Physics at the CLIC e+e- Linear Collider -- Input to the Snowmass process 2013

Halina Abramowicz, Angel Abusleme, Konstatin Afanaciev, Gideon Alexander, Niloufar Alipour Tehrani, Oscar Alonso, Kristoffer K. Andersen, Samir Arfaoui, Csaba Balazs, Tim Barklow, Marco Battaglia, Mathieu Benoit, Burak Bilki, Jean-Jacques Blaising, Mark Boland, Marça Boronat, Ivanka Božović Jelisavčić, Philip Burrows, Maxim Dominik Dannheim, Marcel Demarteau, Marco Aurelio Diaz Gutierrez, Angel Diéguez, Konrad Elsener, Dan Feldman, Uli Felzmann, Mirosław Firlej, Elena Firu, Tomasz Fiutov García García, Veta Ghenescu, Gian Giudice, Norman Graf, Christian Grefe, Christophe Hauschild, Helga Holmestad, Marek Idzik, Christian Joram, Sergey Kananov, Yannis Ka Klempt, Sabine Kraml, Beata Krupa, Szymon Kulis, Tomáš Laštovička, Greg LeBlanc, Ah Angela Lucaci Timoce, Strahinja Lukić, Vladimir Makarenko, John Marshall, Victoria Ma Milutinović-Dumbelović, Akiya Miyamoto, Klaus Mönig, Gudrid Moortgat-Pick, Jakub M Mila Pandurović, Duccio Pappadopulo, Bogdan Pawlik, Werner Porod, Stéphane Poss, T Rattazzi, Sophie Redford, Jose Repond, Sabine Riemann, Aidan Robson, Philipp Roloff, Ruiz-Jimeno, Heidi Rzehak, André Sailer, Dieter Schlatter, Daniel Schulte, Felix Sefkow Sicking, Frank Simon, Jacob Smith, Christian Soldner, Steinar Stapnes, Jan Strube, Taik not shown)

This paper summarizes the physics potential of the CLIC high-energy e+e- linear collider. It provides input to the Snowmass 2013 process for the energy-frontier working groups on The Higgs Boson (HE1), Precision Study of Electroweak Interactions (HE2), Fully Understanding the Top Quark (HE3), as well as The Path Beyond the Standard Model -- New Particles, Forces, and Dimensions (HE4). It is accompanied by a paper describing the CLIC accelerator study, submitted to the Frontier Capabilities group of the Snowmass process.

Physics > Accelerator Physics

https://arxiv.org/abs/1305.5766

[Submitted on 24 May 2013]

CLIC e+e- Linear Collider Studies - Input to the Snowmass process 2013

Dominik Dannheim, Philippe Lebrun, Lucie Linssen, Daniel Schulte, Steinar Stapnes

This paper addresses the issues in question for Energy Frontier Lepton and Gamma Colliders by the Frontier Capabilities group of the Snowmass 2013 process and is structured accordingly. It will be accompanied by a paper describing the Detector and Physics studies for the CLIC project currently in preparation for submission to the Energy Frontier group.

Snowmass 2013 report

https://www.slac.stanford.edu/econf/C1307292/

Planning the Future of U.S. Particle Physics

The Snowmass 2013 Proceedings

Organized by
The *Division of Particles and Fields* of the *American Physical Society*

Editors
Norman A. Graf, Michael E. Peskin, Jonathan L. Rosner

Energy Frontier

Chapter 3: Energy Frontier
Conveners: R. Brock and M. E. Peskin

Working Group Summary (arXiv:1401.6081)

Subgroup Reports:

18.	Higgs Boson	1310.8361
19.	Precision Study of Electroweak Interactions	1310.6708
20.	Quantum Chromodynamics and the Strong Force	1310.5189
21.	Fully Understanding the Top Quark	1311.2028
22.	New Particles, Forces, and Dimensions	1311.0299
23.	Flavor Mixing and CP Violation at High Energies	

Contributed Papers:

General:

002	J. Brau, *et al.*	The International Linear Collider	1304.2586 (PDF)
031	J. Brau, *et al.*	The Physics Case for an e+e- Linear Collider	1210.0202 (PDF)
054	J. S. Gainer, *et al.*	The Matrix Element Method: Past, Present, and Future	1307.3546 (PDF)
065	H. Abramowicz, *et al.*	Physics at the CLIC e+e- Linear Collider -- Input to the Snowmass process 2013	1307.5288 (PDF)
078	ATLAS Collaboration	Physics at a High-Luminosity LHC with ATLAS	1307.7292 (PDF)

Process structure 2013:

Contributed papers
–> Subgroup reports
–> Working Group Summary
–> Overall Summary
[along lines of ESU Briefing Book]

Snowmass perspective

Snowmass is important for US prioritization and funding outlook

Important to inject CLIC physics and technology into the Snowmass 2021 process

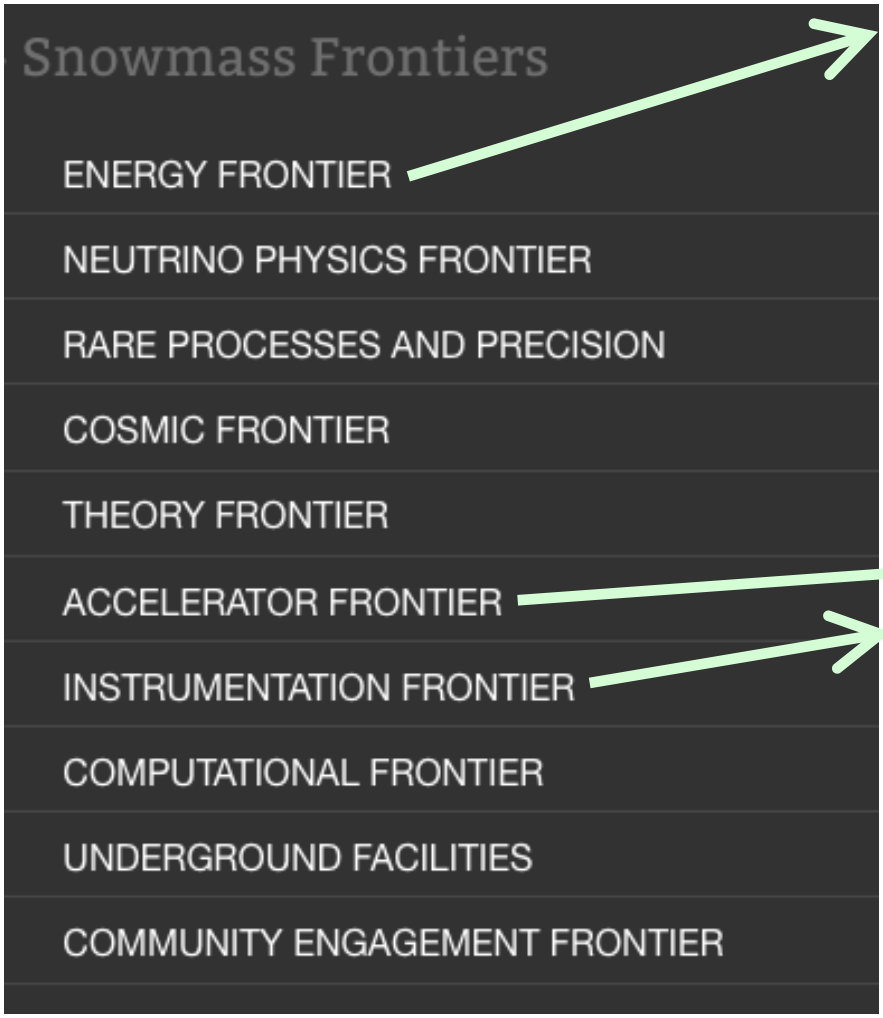
Overview of physics potential should include case for high-energy e^+e^- collisions

Organisation 2021

https://snowmass21.org/

10 overall themes ("Frontiers")

Each "Frontier" divided into "Topical Groups"



- EF01: EW Physics: Higgs Boson properties and couplings
- EF02: EW Physics: Higgs Boson as a portal to new physics
- EF03: EW Physics: Heavy flavor and top quark physics
- EF04: EW Precision Physics and constraining new physics
- EF05: QCD and strong interactions: Precision QCD
- EF06: QCD and strong interactions: Hadronic structure and forward QCD
- EF07: QCD and strong interactions: Heavy Ions
- EF08: BSM: Model specific explorations
- EF09 - BSM: More general explorations
- EF10: BSM: Dark Matter at colliders

- AF1: Beam Physics and Accelerator Education
- AF2: Accelerators for Neutrinos
- AF3: Accelerators for EW/Higgs
- AF4: Multi-TeV Coliders
- AF5: Accelerators for PBC and Rare Processes
- AF6: Advanced Accelerator Concepts
- AF7: Accelerator Technology R&D

- IF1: Quantum Sensors
- IF2: Photon Detectors
- IF3: Solid State Detectors and Tracking
- IF4: Trigger and DAQ
- IF5: Micro Pattern Gas Detectors
- IF6: Calorimetry
- IF7: Electronics/ASICs
- IF8: Noble Elements
- IF9: Cross Cutting and Systems Integration

Organisation 2021

Topical groups are starting now:
kickoff meetings, mailing lists, twikis, slack channels

Groups are at different stages; example of one that is underway:

EF09 - BSM: More general explorations

- EF09 - BSM: More general explorations
  - Group Topics
  - Meetings
  - Contacts

Conveners	Tulika Bose, Zhen Liu, Simone Pagan Griso (more contact info)
Mailing-list	SNOWMASS-EF-09-BSM_GENERIC@FNAL.GOV (instructions)
Slack channel	ef09-bsm_generic (instructions)
Next Event	May 8th 12pm ET, online EF09 Kick-off Mee
Expression of Interest	https://forms.gle/1freqMHfTjAobga86

This topical group aims to study the sensitivity of Beyond Standard Model (BS
the energy frontier. Particular emphasis is given to signatures that appear in a

This TWiki page collects useful information on organization, topics, and techn
community. Please check for updates often and subscribe to our mailing list (s

Group Topics

An initial list of topics to be covered by this topical group are:

- New Fermions, e.g., Top partners, Excited Quarks/Leptons, Sterile Neutrinos
- New Bosons, e.g., W', Z', diboson-resonances
- Dark/Hidden sectors, e.g., ALP, dark photons
- Long-live particle signatures
- BSM interplay with EFT

The list above is not meant to be a comprehensive list, but rather a starting point. Please do not hesitate to contact us with more ideas and studies.

Synergies with other topical groups and frontiers are highly anticipated. All groups commit to working together to ensure the least possible duplication and a full sharing of information. Notable examples of cross-group topics mainly discussed by other topical groups but very relevant for this topical group as well include:

- mono-X searches (EF10 - BSM: Dark Matter at colliders)
- EFT analyses of EWK observables (EF04 - EW Precision Physics and constraining new physics)
- Heavy Higgs searches and exotic Higgs decays (EF02 - EW Physics: Higgs Boson as a portal to new physics)
- Model-specific searches for excited fermions (EF09 - BSM: Model specific explorations)

Opportunities for input

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

–> 2 page docs for Snowmass conveners to see what proposals to expect & encourage the community to begin studying them, and to shape Snowmass Planning Meeting (Nov 2020). Letters should give brief descriptions of the proposal and cite the relevant papers to study. (Authors of LoIs encouraged to submit a full write-up as a contributed paper.)

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

–> may include white papers on specific scientific areas, technical articles presenting new results, and reasoned expressions of physics priorities. 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.

Workshops

2020 Snowmass Planning Meeting (Nov. 4 - 6, 2020 at Fermilab)

Various workshops will be organized by Frontier Conveners, Nov 2020 – July 2021

2021 Snowmass Summer Study (July 11 - 20, 2021 at UW Seattle).

Planning CLICdp input 2021

For discussion:

- Suggest two LoIs: CLIC Physics, and CLIC detector R&D
  –> to become two white papers on these topics

  LoIs due end August; sooner better
  White papers can also be submitted relatively soon (and can be updated later)
  Physics input likely to be similar to European Strategy formal input document

- For physics topics: identify CLICdp people who can be responsible for following relevant Topical Groups: attend meetings, report back to CLICdp analysis WG meeting on issues discussed & questions raised

–> please let us know if you are interested, or already planning to participate

- ★ EF01: EW Physics: Higgs Boson properties and couplings
- ★ EF02: EW Physics: Higgs Boson as a portal to new physics
- ★ EF03: EW Physics: Heavy flavor and top quark physics
- ★ EF04: EW Precision Physics and constraining new physics
- (★) EF05: QCD and strong interactions: Precision QCD
- EF06: QCD and strong interactions: Hadronic structure and forward QCD
- EF07: QCD and strong interactions: Heavy Ions
- ★ EF08: BSM: Model specific explorations
- ★ EF09 - BSM: More general explorations
- ★ EF10: BSM: Dark Matter at colliders

Encouraging new US e^+e^- participation

Traditionally, new studies are done during Snowmass

–> following the US e^+e^- mini-workshop on 22/4, Lucie provided information on participation on e^+e^- studies, encouraging new participants to use existing tools and join existing efforts

Those slides are posted at the end of the mini-workshop site:
https://indico.cern.ch/event/896263/

and are attached to this CLICdp General meeting indico for your information

Planning CLICdp input 2021

–> Discussion

THANK YOU !