

Snowmass and ILC



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The process for future planning for high-energy physics in the US has two stages:

Snowmass 2022 — a grassroots study organized by the APS Division of Particles and Fields and the Division of Beams

P5 — a subpanel of HEPAP directly advising the US government

Snowmass 2022 is going on now. After starting in April 2020 but taking a long break until the end of the pandemic, it will conclude with a meeting at the University of Washington in July 2022. **Both Snowmass and P5 are structured to have global participation.**

The community opinions expressed in the Snowmass study will provide the inputs to the P5 report.

All four of the proposed Higgs factories – CEPC, FCC-ee, CLIC, and ILC – have established a strong presence at Snowmass seminars and workshops.

CLIC and CLIC technology experts have made a strong showing at Snowmass. See the talk of Phil Burrows on Monday for a list of submitted papers, and note that there is a dedicated Snowmass topical group (AF4) on multi-TeV colliders.

However, Snowmass is much more timely and important for ILC. I will concentrate on ILC in this talk.

Snowmass 2022 is crucially important to ILC.

ILC is the one proposal that is on the table now.

With strong support at Snowmass 2022 and a positive recommendation from P5, major US participation the ILC could be funded in the US FY 2024 budget. If this does not happen, there is a long wait for the next chance to fund any Higgs factory.

Thus, I encourage all of you to contribute to our efforts to explain and promote ILC at Snowmass, and to encourage others to become engaged.

I especially welcome those involved with other e+e- proposals. We have a real chance now to build a collider and do the physics on a time line relevant to your careers. Let's not miss it.

The organization of the Snowmass study is mapped out on the Snowmass wiki pages:

<https://snowmass21.org/>

The work is divided into “Frontiers”. Future e+e- experiments belong to the **Energy Frontier**. There are projects relevant to ILC going on in many other Frontiers:

Rare Processes, Cosmic, Theory, Accelerator, Instrumentation, Computation, Community Engagement

The ILC Snowmass group:

Keisuke Fujii, Christophe Grojean, Michael Peskin;
Tim Barklow, Yuanning Gao, Shinya Kanemura, Jenny
List, Mihoko Nojiri, Maxim Perelstein, Roman Poschl,
Jurgen Reuter, Frank Simon, Tomohiko Tanabe,
James Wells; Mikael Berggren, Esteban Fullana, Juan
Fuster, Frank Gaede, Stefania Gori, Daniel Jeans,
Adrian Irles, Sunghoon Jung, Shin-Ichi Kawada,
Shigeki Matsumoto, Chris Potter, Jan Strube, Taikan
Suehara, Junping Tian, Marcel Vos, Graham Wilson,
Hitoshi Yamamoto, Ryo Yonamine, Aleksander Filip
Zarnecki; James Brau, Hitoshi Murayama

see: “[ILC Study Questions for
Snowmass 2021](#)”, arXiv:2007.03650

This group put together a substantial set of resources for studies of e^+e^- physics at Snowmass:

The report “**ILC Study Questions**”, with the most up-to-date bibliography of e^+e^- physics in the Higgs factory energy range.

A website <http://ilcsnowmass.org> with simulation tools – including a new ILC version of Delphes – and complete sets of SM background samples for physics studies.

Recorded **tutorials** for all of the above.

The ILC Snowmass group also includes **liaisons** to all of the relevant Snowmass working groups (see p. 4 of the report).

Using these materials, we can encourage our colleagues at the LHC and in other communities to dip their toes into the e^+e^- waters.

The SiD and ILD concept groups are open to new guest members during Snowmass. This gives another opportunity to learn and contribute.

We envision that the ILC Snowmass group will merge smoothly with — and become the initial support for — the new ILC working groups being established under the IDT WG3.

Beyond this activity, one more large task needs to be done for Snowmass.

As a working paper for the Snowmass conveners, and as a reference document for the P5 panel, we are now preparing the **ILC Report to Snowmass 2022**.

This will be a white paper of about 200 pages, covering all aspects of the ILC project.

Here is the table of contents 



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We encourage all members of the HEP community to participate in the writing of this report.

Successive versions will appear at the web site:

<https://agenda.linearcollider.org/event/9135/>

Please register at that site to join the author list. We consider the signatures as endorsements. In addition, if you would like to contribute material to the report, we welcome you. The writing is organized by chapters. To contribute, please work with the “corresponding editors” for the chapters of interest to you.

Opportunities are available for contributions on the accelerator design, accelerator technologies, detector technologies, physics simulation studies, experimental proposals and design, calculational tools, theoretical interpretation of the ILC results (both model-independent and model-dependent).

If you are interested in future e^+e^- physics – from any point of view – we would appreciate your help.

Snowmass contains many activities outside of ILC that potentially contribute to the ILC story. I would like to highlight one.

A major discussion point at Snowmass has been the exploration of the **10s of TeV** scale in parton energies. This would be the next major step in accelerator energy beyond LHC. The AF1/AF4/AF6 groups are hosting a forum on **“Physics Limits of Ultimate Beams”**.

Almost all of the discussion has centered on large proton colliders and muon colliders. Given that we do not know that these technologies are feasible and affordable, I consider this rather narrow-minded.

Without neglecting the importance of supporting a next-generation e⁺e⁻ machine, it is not too early to begin thinking about a next-to-next generation machine.

We electron enthusiasts ought to capture the high ground here.

I am personally interested in the proposal of a **30 TeV $\gamma\gamma$ collider** based on electron advanced acceleration, for example, by plasma wakefields.

Perhaps you have a better idea. If it involves electrons, it requires a long straight tunnel. **The ILC lab will make this available, and it will be the road to the far future.**

There are many other speculative ideas for the future being discussed at Snowmass.

To move these forward – and for many more immediate reasons discussed at this workshop – we desperately need to start the next global accelerator project as soon as possible.

With ILC, we have our chance. Let's do what we can to help it succeed.