

FCC

The Swiss Perspective

G. Dissertori

ETH Zurich

CH Scientific Delegate to the CERN Council

Workshop on :

Fostering Swiss collaboration towards a future circular collider

7.9.2021

Preamble

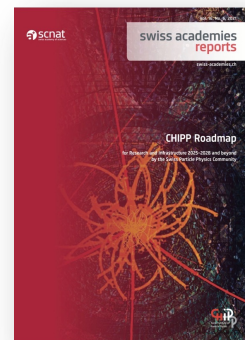
- From the very beginning, Switzerland was involved and has strongly supported the FCC idea and vision
- at different levels, in different occasions and roles
- In the following, I will briefly summarize this CH involvement and support
 - Bottom-up, at the community and scientific level
 - at the “political” level

The bottom-up / scientific efforts (1)

- Strong and leading involvement by Swiss scientists from the early days on:
 - A. Blondel: one of the original proponents of the FCC-ee idea and co-leader of the corresponding “Physics and Experiments” efforts in the recent years
 - L. Rivkin was the first International Collaboration Board Chair from March 2015 until the end of 2018 (completion of CDR)
 - PSI and EPFL joined the collaboration in 2014 as some of its first members.
 - GD has been chairperson of the FCC International Advisory Committee since 2017, following the developments towards the CDRs, and chaired the recent injector and placement study reviews
 - R. Wallny is member of the IFNC (Informal Forum of National Contacts)

The bottom-up / scientific efforts (2)

- Very clear input by the Swiss community to the European Strategy Update:
 - See <https://indico.cern.ch/event/765096/contributions/3295813/>
 - the result of a consensus, reached in a series of discussions among the Swiss researchers in particle and astroparticle physics - organized in the Swiss Institute for Particle Physics, CHIPP
 - Held two workshops in 2018
 - April 2018: review of and discussion on the status of the field
 - Sep 2018: discussed and agreed upon the concrete input to be provided.
- and clear and strong statement of support by CHIPP after the adoption of ESPP update in mid 2020
 - Including the recent release of the CHIPP Roadmap



The bottom-up / scientific efforts (3)

A: LHC exploitation and next high-energy frontier machine at CERN

With the HL-LHC, new physics will be fully probed up to an energy scale of at least ~ 1 TeV in the near future. The next step has to include decisive studies of the properties of the Higgs and the top quark. This should then be followed by the exploration of an energy scale that is an order of magnitude higher than what can be reached with the LHC in the years to come.

For this reason, the Swiss community considers the FCC to be the most promising project for the next high-energy frontier machine at CERN. The FCC would start as an e^+e^- collider. It is a challenging project that requires R&D, but does not need the technically very demanding superconducting high field magnets. Multiple experiments can be operated simultaneously with luminosities significantly larger than those at future linear colliders. The FCC-ee would be able to explore the presence of new physics through tests of the electroweak theory with one to two order of magnitudes better precision than now. It would also extend heavy flavour physics and searches for extremely rare

https://indico.cern.ch/event/765096/contributions/3295813/attachments/1785324/2906376/European_Strategy_Swiss_input.pdf

processes. Furthermore, FCC-ee would provide many more Higgs particles than CLIC or ILC and an interesting opportunity for $t\bar{t}$ studies near threshold.

With proton-proton collisions at $\sqrt{s} = 100$ TeV as the next phase, the FCC-hh probes a completely new energy regime, which is the right next step for the exploration of the 10 TeV mass scale. In order to achieve this goal, R&D efforts must be intensified with a focus on high-field magnets.

Full exploitation of the LHC should remain as the first priority for the European particle physics programme, in parallel with an intensified R&D and design effort to realise the next large project at CERN in the future, namely FCC. The Swiss particle physics community considers that Europe should pursue an ambitious plan to lead high energy frontier physics.

For the long term future of particle physics, R&D for innovative concepts for acceleration technology is crucial in order to reach an energy scale far beyond 10 TeV, which is currently out of scope. *Current R&D efforts for novel acceleration and other accelerator technologies must continue and be strengthened.*

The bottom-up / scientific efforts (4), supported by our funding agencies: **CHART**

- Strong Accelerator R&D "Stimulus Package" Program :
 - CERN, EPFL, ETHZ, ETH domain, UniGE, PSI, State Secretariate of Education, Research and Innovation
 - **Main topics** pursued during the current CHART2 program:
 - High Field Magnet R&D (including HTS)
 - Beam Dynamics and FCCee injector studies
 - Site feasibility studies (geodesy, geological modelling)

Support at the political level

- Very strong support by the State Secretariat for Education, Research and Innovation (SERI):
 - via the CERN Council Delegation
 - by close interactions with the French counterparts
- Examples:
 - very strong support by the CH Council Delegation**
 - for the ESPP update
 - and for the launching of the FCC feasibility study

This is an important and great moment. The Swiss Delegation supports, with enthusiasm, the Council Resolution on the 2020 Update of the European Strategy for Particle Physics. As one of the two Host States of CERN, Switzerland together with its particle physics community embraces this strategy update that also lays the foundations for a continued bright future of CERN.

Conclusions

- Switzerland, as one of the two Host States, has the strongest interest in a bright and long-term future of CERN
- Such a future can only be secured by a visionary project such as the FCC
- The Swiss community has contributed to this vision already, but time has come to switch gears and get involved more strongly, especially in the Physics and Experiments studies.
- A great opportunity for the younger generation to “design from scratch” and to shape their own future