



European Strategy for Particle Physics and Ongoing Update

<https://europeanstrategygroup.web.cern.ch/EuropeanStrategyGroup/>
ECFA Plenary Session

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Chair of Strategy Group and Preparatory Group



Preparation for Updating the Strategy, started in Summer 2011

Current Strategy

- Current strategy was adapted by the Council in July 2006
- It consists of 17 strategy statements:
 - two General issues; necessity of strategy
 - **eight on Scientific activities** (LHC, Accelerator R&D, ILC, Neutrino, Astroparticle, Flavour, Nuclear physics, Theory)
 - four Organizational issues
 - CERN Council's role in coordinating European particle physics
 - Globalization
 - Non-member state relation
 - Relation with EU
 - three Complementary issues
 - Outreach
 - Technology Transfer Network
 - Relation with industry

Framework of the Update

- Strategy Group and Preparatory Group set-up by the CERN Council
 - Preparatory Group
 - Producing scientific summary in a form of Briefing Book based on the community, funding agencies and policy makers inputs given at **Open Symposium** and written contributions
 - Strategy Group
 - **Draft the updated strategy** based on the scientific input from the Preparatory Group and non scientific input from its own working groups.
 - Producing deliberation document providing scientific rationale for the strategy statements and discussion on possible governance and organization for strategy implementation
 - Producing glossy brochure for public, funding agencies and politicians

Composition of the Groups

- Preparatory Group
 - Nominated from SPC, ECFA, CERN, Americas and Asia
 - members of the Scientific Secretariat for the Council
- Strategy Group
 - **Members**
 - **Delegates from the Member States**, representing the member state government
 - Observer with right to speak
 - Delegates from Associate and Observer States
 - Representatives from ApPEC, NuPEC, ESFRI, EU, FALC,
 - Director of Large National Laboratories and CERN DG
 - Members of the Scientific Secretariat for the Council
 - Preparatory Group members are also invited

Cracow Open Symposium for the European Strategy Updates

NB. No conclusion yet

Overview

- On 10 to 12 September, two and half days of session
- Close to 500 participants
- Plenary speakers summarising the current status and future options, with long discussion sessions, for

- high energy frontier
- Flavour and symmetries
- Strong interactions
- Astroparticle physics
- Neutrino

directly relevant for the
scientific strategy

- Theoretical physics
- Accelerator science
- Instrumentation, computing, and infrastructure

relevant for
auxiliary
issues of
the strategy

- **Very good local organization!!**

Some of the discussed points (I)

- Direct-search of new particles at High Energy Frontier and Indirect-search of new physics, i.e. precision measurements at any energy machines to study rare processes looking for a deviation from the Standard Model calculations, are providing fruitful complementary results. But no compelling sign of New Physics so far.
→ Continue pushing at two fronts is essential.

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- Direct-search of new particles at High Energy Frontier and Indirect-search of new physics, i.e. precision measurements at any energy machines to study rare processes looking for a deviation from the Standard Model calculations, are providing fruitful complementary results. But no compelling sign of New Physics so far.
 - Continue pushing at two fronts is essential.
- Discovery of “Higgs” like boson at LHC opens a new line of indirect-search: precision measurement of “Higgs” properties.
 - **Is LHC alone enough or a *new facility also needed?***
Linear or Circular e^+e^- colliders, Circular $\mu^+\mu^-$ collider $\gamma\text{-}\gamma$ collider based on circular e^- storage rings
 - **A new machine with only Higgs justifiable?**

Some of the discussed points (II)

- LHC serves for a wide platform with open questions:
 - Direct (ATLAS&CMS) and indirect (LHCb) New Physics search, perturbative and non-perturbative QCD (ALICE, ATLAS, CMS, LHCb, etc.). Further exploitation is possible by upgrading the machine luminosity and detectors.
 - **What is the scientific scope for the upgrade from 0.3 to 1~3 ab^{-1} ? (W_L scattering, H self-coupling, ..)**

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 - What is the scientific scope for the upgrade from 0.3 to 1~3 ab^{-1} ? (W_L scattering, Trip.H. coupling, ..)
- The next large machine at CERN:
 - A machine **running concurrently with LHC possible?**
e.g. LHeC (or possibly LEP3)
 - Is PDF measurements by LHeC crucial for High-Lumi LHC?*
 - For making a decision, **input from the LHC run at 13~14 TeV is needed**

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- Major challenges in neutrino physics: **mass hierarchy**, precision measurement of the **mixing parameters** (in particular **the CP violation phase**), **sterile neutrinos**.

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- European neutrino community presented
 - **CERN SPS long baseline neutrino beam to Finland** with a massive liquid Ar detector for the mass hierarchy and mixing parameter measurements → ApPEC joint coordination?
 - **CERN SPS short baseline neutrino beam** for sterile neutrino search, with existing detector moving from GSNL to CERN
 - **Neutrino factory** for ultimate precision measurements of the mixing parameters **for a longer term future.**

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- Interest generated by an idea of muon storage ring without pre-cooling. A clean low energy neutrino source for sterile neutrino search, with conventional technology(?)
- Possibilities of having long baseline wide band ν beam in Europe other places than CERN?

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- JP community pushes **250-500 GeV linear e^+e^- collider** with a hope to start data taking before 2030, and **Hyper Kamiokande water Cherenkov** (or liquid-Ar in Okinoshima) detector for JPARC neutrino beam with a hope to start construction in ~ 2018 , while SuperKEKB construction is in progress.

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- For high baryon density environment, SPS can provide interesting data, as well as RICH, and new facilities, e.g. FAIR, NICA,:
 - Do we need experiments at all the facilities?

What will follow

Foreseen Steps

- 21-26 January 2013, drafting session of the European Strategy Group in Erice.

Start from the Current Strategy, e.g.

- 3. The LHC will be the energy frontier machine for the foreseeable future, maintaining European leadership in the field; *the highest priority is to fully exploit the physics potential of the LHC, resources for completion of the initial programme have to be secured such that machine and experiments can operate optimally at their design performance*. A subsequent major luminosity upgrade (SLHC), motivated by physics results and operation experience, will be enabled by focused R&D; *to this end, R&D for machine and detectors has to be vigorously pursued now and centrally organized towards a luminosity upgrade by around 2015*.

→LHC is running now. May be more concrete statements for the upgrade needed.

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- 4. In order to be in the position to push the energy and luminosity frontier even further it is vital to strengthen the advanced accelerator R&D programme; *a coordinated programme should be intensified, to develop the CLIC technology and high performance magnets for future accelerators, and to play a significant role in the study and development of a high-intensity neutrino facility.*

→ Accelerator R&D; should be focused on items mainly needed for possible future machines at CERN? Can we do all?

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- 5. It is fundamental to complement the results of the LHC with measurements at a linear collider. In the energy range of 0.5 to 1 TeV, the ILC, based on superconducting technology, will provide a unique scientific opportunity at the precision frontier; *there should be a strong well-coordinated European activity, including CERN, through the Global Design Effort, for its design and technical preparation towards the construction decision, to be ready for a new assessment by Council around 2010.*

→ Japanese HEP community sees a window of opportunity for the next couple of years to host ILC. What is the European position toward this initiative? Should this be seen as an opportunity for a new worldwide facility, complementing a possible future machine at CERN without jeopardizing it?

Start from the Current Strategy, e.g.

- 6. Studies of the scientific case for future neutrino facilities and the R&D into associated technologies are required to be in a position to define the optimal neutrino programme based on the information available in around 2012; *Council will play an active role in promoting a coordinated European participation in a global neutrino programme*

Now θ_{13} is measured and the necessary short term neutrino facilities and experiments are well defined and proposed. Should Europe build its own facilities or participate in those in other regions?

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- Outreach event in May in Brussels, also targeting at the EU parliament members.

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- **Brochure** for **funding agencies, politicians, and public**
by CERN communication group and Strategy Group