



European Strategy for Particle Physics Proposed Draft to the CERN Council

<https://europeanstrategygroup.web.cern.ch/EuropeanStrategyGroup/>
ECFA Linear Collider Workshop

Hamburg, Germany, 27 May 2013

T. Nakada

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Lausanne, Switzerland

Scientific Secretary for Strategy Session of CERN Council
Chair of Strategy Group and Preparatory Group



Timeline of the Update

- Preparation of the update started in 2011 by setting up Strategy Group and Preparatory Group by the Council
- September 2012: **Open Symposium Organised by the Preparatory Group scientific input from the community**
- December 2012: Scientific Briefing Book by the Preparatory Group based on the community input (Open Symposium + written submissions)
- January 2013: Strategy Group drafting session **Draft of updated European Strategy** made, submitted to the Council and made **available to the community**
- March 2013: Council discussion on the draft aiming for an agreement on the updated Strategy
- **May 2013: The Council formally adopting the Strategy**

Who prepared the Scientific Input?

The European Strategy Preparatory Group (ESPG) Members

Strategy Secretariat Members

Prof. T. Nakada	Scientific Secretary (Chair)
Prof. F. Zwirner	SPC Chair
Dr M. Krammer	ECFA Chair
Dr Ph. Chomaz	Repres. EU Lab. Directors
Prof. E. Tsesmelis	Scientific Assistant

SPC

Prof. R. Aleksan (FR)
Prof. P. Braun-Munzinger (DE)
Prof. M. Diemoz (IT)
Prof. D. Wark (UK)

ECFA

Prof. K. Desch (DE)
Prof. K. Huitu (FI)
Prof. A. P. Zarnecki (PL)
Prof. C. De Clercq (BE)

CERN

Dr P. Jenni

ASIA/AMERICAS

Prof. Y. Kuno (Asia)
Prof. P. McBride (Americas)

Who drafted the Strategy

European Strategy Group (ESG)

Members

Member States Representatives

Austria	Prof. A. H. Hogang
Belgium	Prof. W. Van Doninck
Bulgaria	Prof. L. Litov
Czech Republic	Prof. J. Chyla
Denmark	Prof. J.J. Gaardhoje
Finland	Prof. P. Eerola
France	Prof. J. Martino
Germany	Prof. S. Bethke
Greece	Dr P. Rapidis
Hungary	Prof. P. Levai
Italy	Prof. F. Ferroni
Netherlands	Prof. S. De Jong
Norway	Prof. A. Read
Poland	Prof. J. Krolikowski
Portugal	Prof. G. Barreira
Slovakia	Dr L. Sandor
Spain	Prof. F. del Aguila
Sweden	Prof. B. Asman
Switzerland	Prof. K. Kirch
United-Kingdom	Prof. J. Butterworth

CERN - Director-General

Prof. R. Heuer

Major European National Labs

CIEMAT	Dr C. Lopez
DESY	Prof. J. Mnich
IRFU	Dr Ph.Chomaz
LAL	Dr A. Stocchi
NIKHEF	Prof. F. Linde
LNF	Dr U. Dosselli
LNGS	Prof. S. Ragazzi
PSI	Dr L. Rivkin
STFC-RAL	Dr J. Womersley

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Prof. E. Tsesmelis	Scientific Assistant

Invited - President of Council

Prof. A. Zalewska

Invitees

Candidate for Accession and Associate Member States

Israel	Prof. E. Rabinovici
Romania	Dr S. Dita
Serbia	H. E. Amb. U. Zvekic

Observer States

India	Prof. T. Aziz
Japan	Prof. Sh. Asai
Russian Federation	Prof. A. Bondar
Turkey	Prof. Dr M. Zeyrek
United-States	Prof. M. Shochet

EU

Dr R. Lecbychova

ApPEC

Dr S. Katsanevas

Chairman FALC

Prof. Y. Okaka

Chairman ESFRI

Dr B. Vierkorn-Rudolph

Chairman NuPECC

Prof. A. Bracco

JINR, Dubna

Prof. V. Matveev

Also invited to the Open Session, Preparatory Group [Members](#)

ESG Working Groups

- European Strategy Group: Members and invitees
 - Working Groups of ESG
 - Working Group 1:
Organisational structure for the Council for the European Strategy and its implementation
 - Working Group 2:
Organisational structure for European participation in global projects. Role and definition of the National Laboratories and the CERN Laboratory in the European Strategy
 - Working Group 3:
Relations with external bodies, in particular EU-related
 - Working Group 4:
Knowledge and technology transfer, and relations with industry
 - Working Group 5:
Communication, outreach and education

Erice Meeting

- Monday
 - Briefing Book summaries and update
 - by Preparatory Group members and Research Director
 - SPC and ECFA inputs
 - by SPC and ECFA chairs
 - Brief statements
 - Member, Candidate for Accession to Membership, Associate Member States and two Observer States (US and Japan)
- Tuesday
 - Discussion on the scientific issues
- Wednesday
 - Reports by the Working Groups followed by the discussion
- Thursday morning (up to here the ESG + invitees can talk)
morning, Discussion on the scientific issues
- Followed by Thursday afternoon and Friday
Strategy drafting by the ESG

Drafting process

- **First draft (during the night of Wednesday to Thursday)**
by the Strategy Secretariat + editorial help
- First discussion Thursday afternoon
- **Second draft (during the night of Thursday to Friday)**
- Second discussion Friday morning
- **Third draft (Friday lunch time)**
- Third discussion Friday afternoon
- **Fourth draft (Friday afternoon coffee break)**
- Fourth discussion Friday evening
line by line reading, real time editing and real time endorsement, item by item.
- Meeting concluded at 18:50 **with fifth draft unanimously endorsed by the ESG members.**

Strategy and Deliberation Paper

- Strategy Paper for the Council approval with 17 statements:
 - Two general issues
 - Four selected high priority large scale projects
 - Five equally important scientific issues
 - Two organisational issues
 - Three issues on social relevance
 - One recommendation for the future strategy activities
- Deliberation Paper (**public document**) by the ESG is to provide
 - **rationale behind the scientific issues**
⇒ partly summarised in this presentation
 - **recommendations of the ESG Working Groups on the non-scientific issues**
⇒ Council may consider taking up for future consideration

Issues during the Erice discussion

- Balance between setting priority vs maintaining diversity
 - Large scale projects with priority: (regional/global facilities)
 - Competitive small to medium scale projects:
national/regional facilities
- Consideration for the large scale projects
 - Many projects were put forward by the community:
LHC, LC, LHeC, LEP3, TLEP, γ - γ Colliders, muon colliders, ...
 - Not all the large scale projects can be done in Europe
→ even with a good scientific case
 - Recent physics discoveries
 - Higgs at 125 GeV/ c^2
 - Neutrino $\theta_{13} \neq 0$
 - Full exploitation of large investment already made
LHC
 - European ambition to stay in the forefront of the energy frontier
 - International landscape in America and Asia

Science at the energy frontier

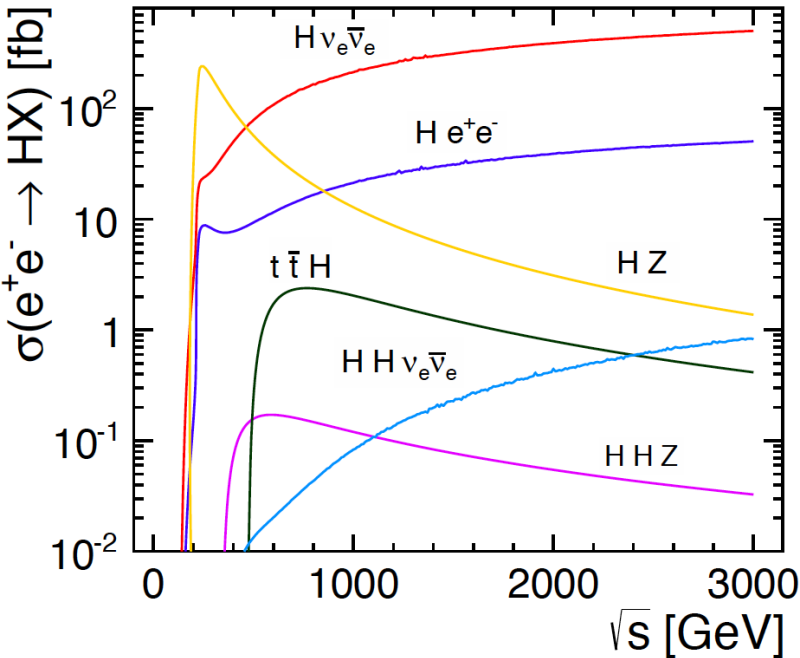
- Higgs study is becoming a precision study to investigate its property in detail: eventually look for deviations from the Standard Model predictions
⇒ High statistics with excellent detectors
- Direct search for new particles is far from completed

LHC is currently the only machine for these studies.

- LHC is a versatile facility used by heavy flavour and heavy ion communities as well
- For a post-LHC machine in Europe
 - Further physics input, in particular results at 14 TeV, is needed for the decision, i.e. for the next Strategy update
 - European ambition is to stay at the forefront of the highest energies needs rigorous R&D.

e^+e^- machines

- Higgs studies at lepton colliders
 - total decay width (including invisible decay modes)
 - absolute branching fractions
 - final states not easily accessible by the LHC
 - etc. ...complementary to LHC, + top mass
- e^+e^- colliders < 1 TeV could be realised, reasonably soon. Important parameters are energy **AND** luminosities!



ILC in Japan, if realised,
would be an opportunity for
particle physics worldwide.

Neutrinos

- Since θ_{13} is now known, one can make a reasonable estimate for **expected performance** of long baseline neutrino experiments **with a conventional accelerator neutrino beam** for the mass hierarchy and oscillation parameters measurements including CP violation, and it **looks promising!**
- Mass hierarchy can also be studied with non-accelerator neutrinos (**⇒NB: domain of ApPEC**)
- CP violation studies require a long baseline project:
 - LAGUNA-LBNO in Europe
 - LBNE-FNAL in US
 - HyperK-JPARC in Japan
- **European groups are at the forefront of detector R&D**
- Overall scale of the project may be too large for Europe to do everything?

Short Summary of the Strategy

- Exploitation of the LHC is the European top priority, including the luminosity upgrade (machine and detectors) to aim at collecting $\int L dt = 3 \text{ ab}^{-1}$ by ~ 2030 .
- Rigorous R&D for the future high energy frontier pp and e^+e^- colliders
- If Japan were to host the ILC, there would be a strong interest for Europe to participate. Wait for the initiative from Japan so that Europe can discuss a concrete plan.
- European group should play a major role in future long baseline ν experiments. CERN should provide a base to form a strong European neutrino group, who should explore future leading facilities in the US and Japan.

Equally important scientific issues

- **Theoretical physics**: increased international cooperation, increased needs for computing resources (super computing for lattice, amplitude computations, event generators, ...)
- Complementary physics programme: **precision physics**
 - Search for new physics: precision experiments are complementary to those at the energy frontier
 - Proven track records for establishing the Standard Model
 - Broad opportunities, current examples are
 - CERN, **KEK**: b, c, τ
 - **IHEP (Beijing)**: c, τ
 - CERN, **FNAL, JPARC, INFN-LNF**: s **National Laboratories**
 - **PSI, FNAL, JPARC**: μ
 - CERN: \bar{p}
- **Detector R&D** and importance of **technical infrastructure** for future large scale experiments and **computing**.
- Even **closer relation with Nuclear and Astroparticle Physics**

One point concerning the organisation

- For European participation in a global project outside of Europe:
 - **Coherent contributions** strengthen the European position
 - CERN is a natural **leading partner** in Europe
 - **Considerable resources** could be provided by **the national laboratories and universities**; national contributions properly acknowledged but in a **coordinated way within Europe**.

Future major facilities in Europe and elsewhere require collaboration on a global scale. *CERN should be the framework within which to organise a global particle physics accelerator project in Europe, and should also be the leading European partner in global particle physics accelerator projects elsewhere. Possible additional contributions to such projects from CERN's Member and Associate Member States in Europe should be coordinated with CERN*

Finally

- After the adoption of the new Strategy by the CERN Council on 30th of May, the implementation phase will start
- Exciting time is in front of us and we should move forward!