Update of European Strategy for Particle Physics

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Outline

- Particle physics in Europe: how it is organised?
- Guided tour of European Strategy
- Strategy update
- Summary

Particle Physics

accelerator

Energy frontier — Direct search of new physics at high energy

Flavour physics — quark sector; lepton sector (charged lepton, neutrino)

flavour mixing, CP, rare decays, mass

proton decays, 0ββ decays, etc.

Astroparticle — in/direct search of exotics from the sky

non-accelerator

Particle Physics

European "particularity"  CERN Council

Energy frontier — Direct search of new physics at high energy

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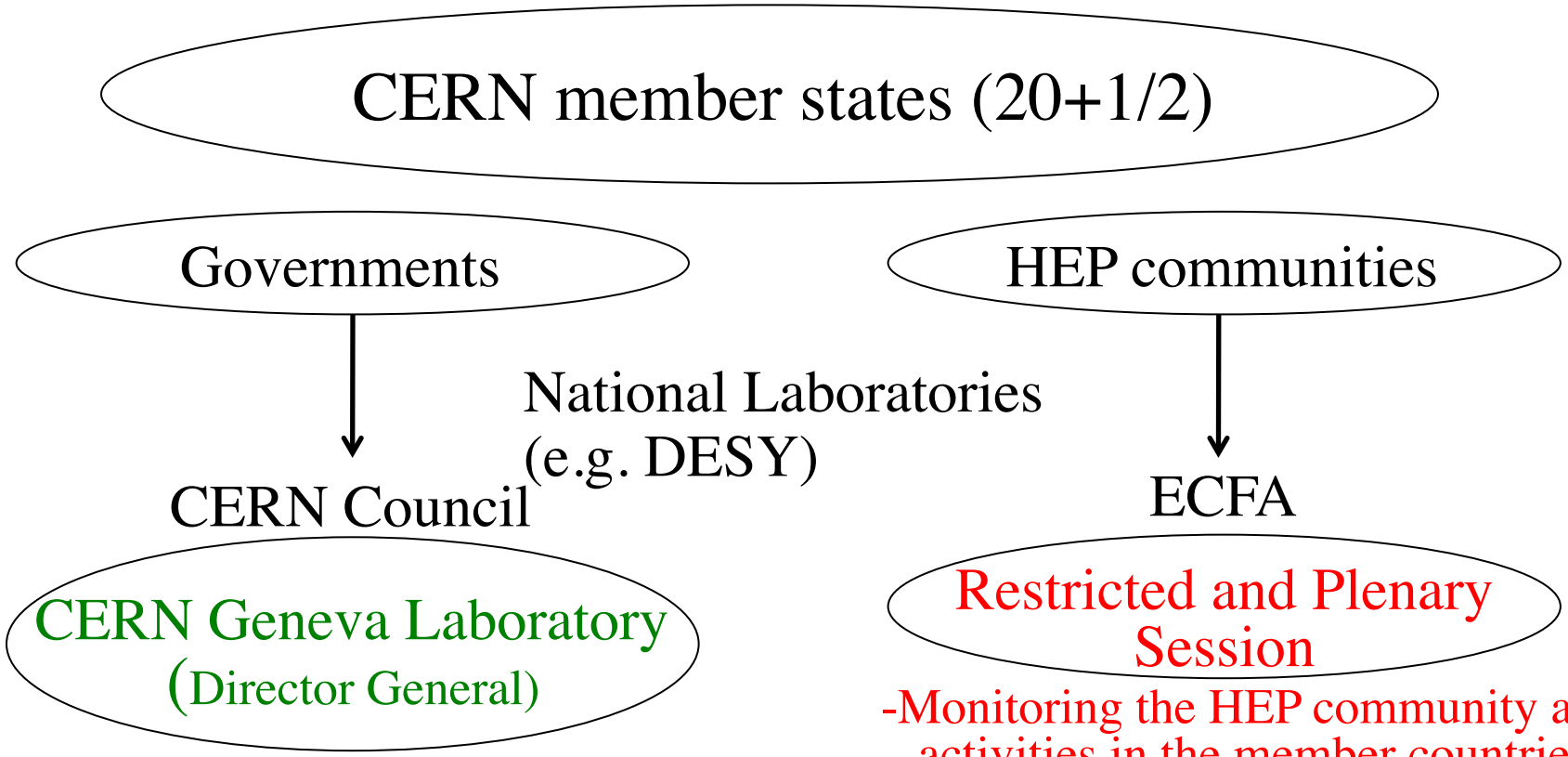
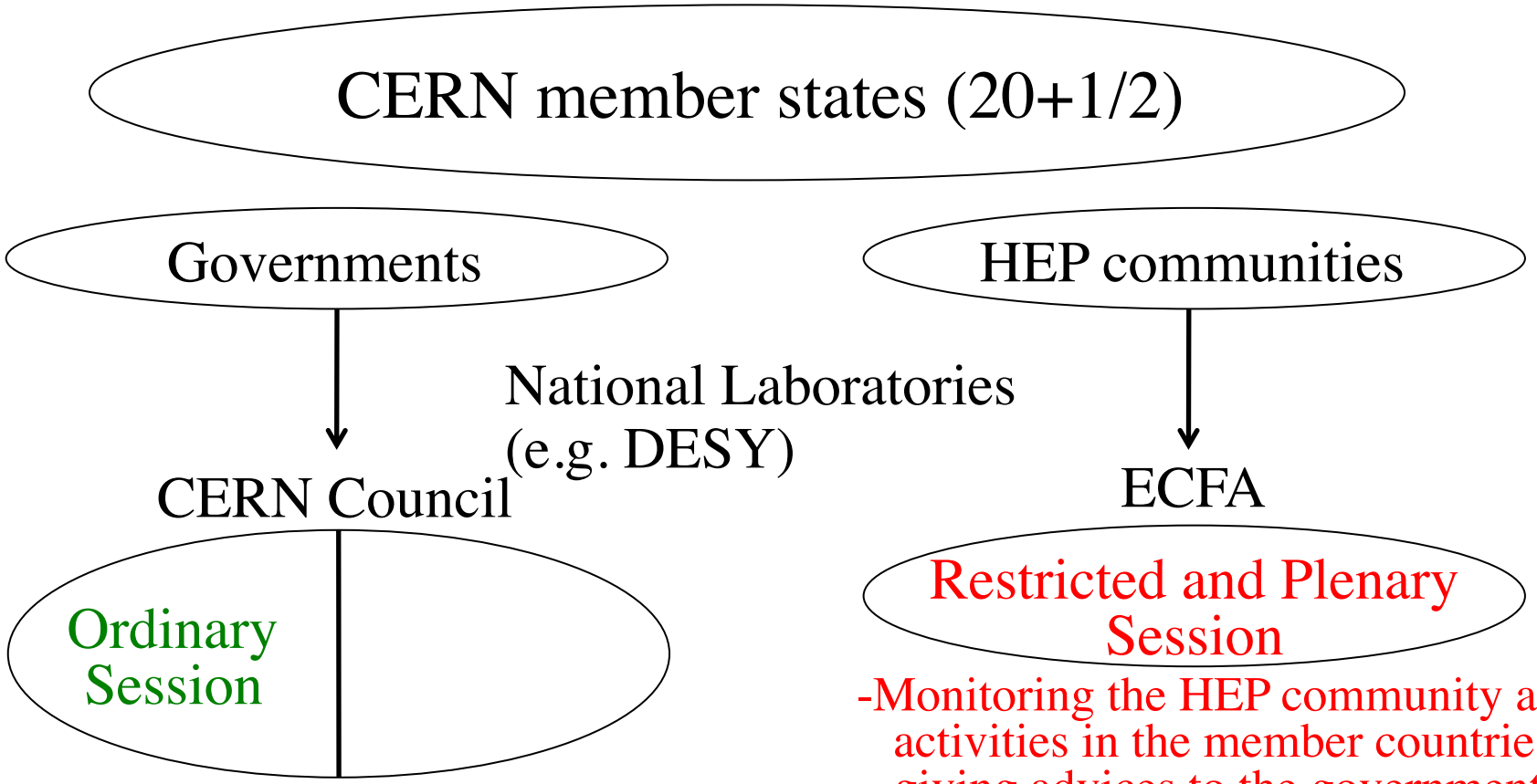
Astroparticle — in/direct search of exotics from the sky

Astroparticle Physics European Strategy

European HEP Structure till 2006



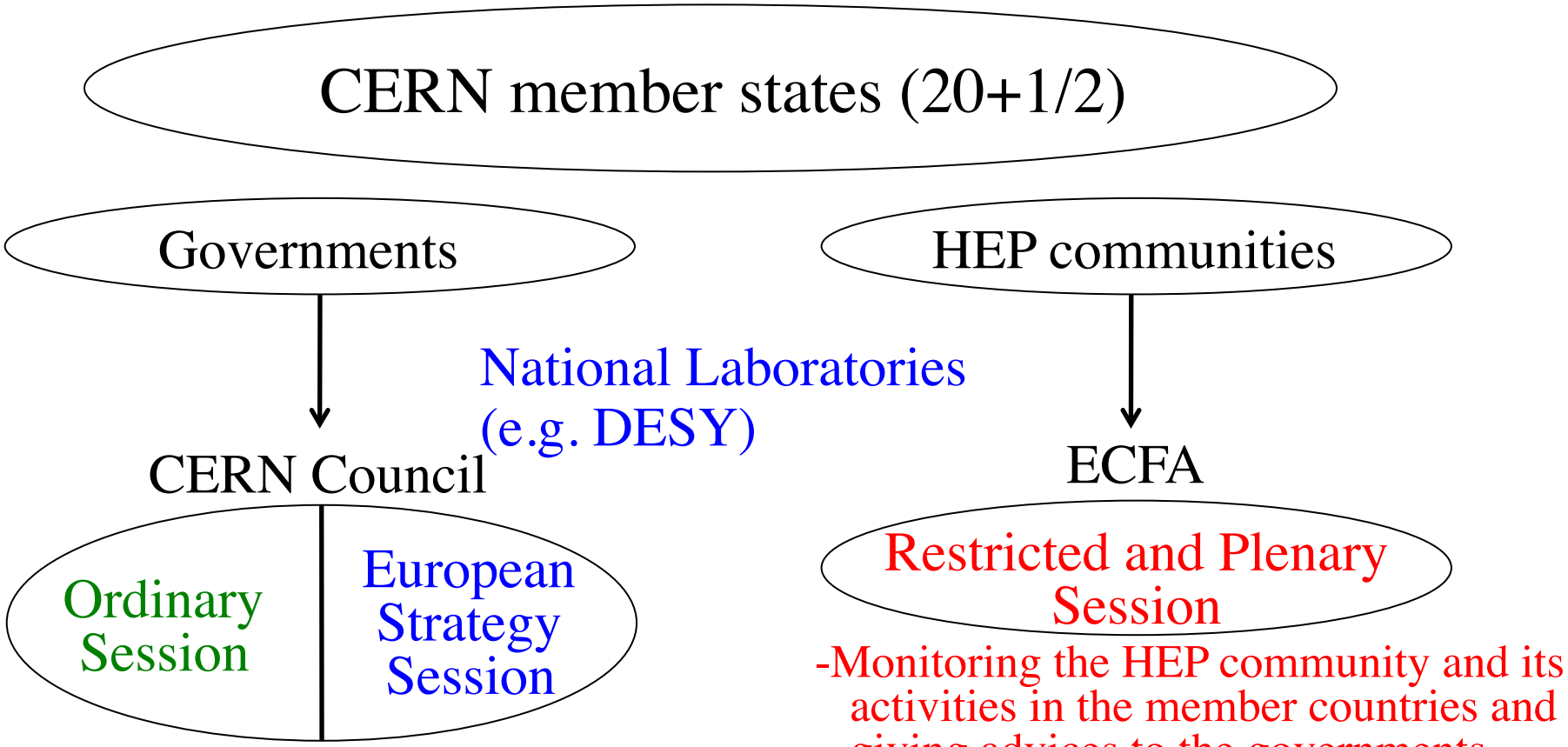
European HEP Structure now



CERN Geneva Laboratory
(Director General)
Running the laboratory

-Monitoring the HEP community and its activities in the member countries and giving advices to the governments
-Incubator for new ideas
-Forming the community opinions

European HEP Structure now



One of the consequences of the European Strategy

European Strategy for Particle Physics

- Current strategy was adapted by the Council in July 2006
- It consists of 17 strategy statements:
  - two General issues; necessity of strategy
  - eight Scientific activities → **main subject of this talk**
  - 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

European Strategy; Scientific Activities

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*.

After some delays, LHC is now progressing well and supported as the highest priority project:
energy frontier: ATLAS and CMS
Flavour physics: LHCb
Heavy ion: ALICE

European Strategy; Scientific Activities

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European Strategy; Scientific Activities

3. The LHC will be the energy frontier machine for the

Coordination and R&D programme under
EU FP7 framework for the accelerator:
EuCARD, SLHC-pp succeeded by HiLumi-LHC.

Due to the delay, a serious upgrade will be not before 2018, or even later.
The current LHC shows more potential than originally expected. Luminosity upgrade might be more adiabatic? Injector upgrade may become more crucial before?

European Strategy; Scientific Activities

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.*

Coordination and R&D programme under
EU FP7 framework:
EuCARD, EUROnu.
CLIC Collaboration.

European Strategy; Scientific Activities

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.*

ILC-HiGrade Consortium: DESY, CEA, CERN, CNRS, INFN, Oxford
Coordination of European GDF activities

European Strategy; Scientific Activities

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New Council assessment is delayed to early 2013 for the Strategy Update: described later.

European Strategy; Scientific Activities

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.***

Coordination and R&D programme under EU FP7 framework for the accelerator: EuCARD, EUROnu,
EUROnu: Looking into Super Beam, Beta Beam and Neutrino Factory
Also: LAGUNA-LBNO

European Strategy; Scientific Activities

7. A range of very important non-accelerator experiments take place at the overlap between particle and astroparticle physics exploring otherwise inaccessible phenomena; *Council will seek to work with ApPEC to develop a coordinated strategy in these areas of mutual interest*.

Framework agreement between
CERN and ApPEC
for R&D has been setup. More concrete implementation will be for
the Updates Strategy coming in 2013.
See later.

European Strategy; Scientific Activities

8. Flavour physics and precision measurements at the high-luminosity frontier at lower energies complement our understanding of particle physics and allow for a more accurate interpretation of the results at the high-energy frontier; *these should be led by national or regional collaborations, and the participation of European laboratories and institutes should be promoted*.

This is a good place to introduce European national laboratories with accelerator working for particle physics!!!

European Strategy; Scientific Activities

- Established national laboratories with accelerators still used for "flavour physics" experiments:
  - Germany — DESY: search for axion like particle, $\sigma_{e^+p}/\sigma_{e^-p}$
  - Italy — INFN Frascati National Laboratory
  - Russia — Budker Institute of Nuclear Physics
    Institute for High Energy Physics
  - Switzerland — Paul Scherrer Institute
- Emerging new organization
  - Italy — **Cabibbo Laboratory**: Italian Consortium to construct SuperB Factory at the University of Rome Tor Vergata (INFN, Tor Vergata, Ministry, … discussion of governance on going)
  - Turkey — Turkish Accelerator Center: Construction of accelerator complex with a possible inclusion of Tau-Charm Factory

European Strategy; Scientific Activities

9. A variety of important research lines are at the interface between particle and nuclear physics requiring dedicated experiments; *Council will seek to work with NuPECC in areas of mutual interest, and maintain the capability to perform fixed target experiments at CERN*.

CERN Geneva laboratory offers facilities for
-Nuclear physics: ISOLDE, n-Tof,..
-Low energy antiproton (AD)
-Fixed target @ PS and SPS (QCD and Flavour)

CERN-ECFA Study Group for LHeC (ep collider with LHC proton) CDR almost ready

European Strategy; Scientific Activities

10. European theoretical physics has played a crucial role in shaping and consolidating the Standard Model and in formulating possible scenarios for future discoveries. Strong theoretical research and close collaboration with experimentalists are essential to the advancement of particle physics and to take full advantage of experimental progress; ***the forthcoming LHC results will open new opportunities for theoretical developments, and create new needs for theoretical calculations, which should be widely supported.***

European Strategy Update

- Originally foreseen in 2011, delayed due to the LHC delay but now work started (Kickoff meeting at the ECFA-EPS joint session of Europephysics HEP conference, July 2011)
  - Draft for the updated strategy will be produced by the European Strategy Group (CERN member states, observer states, etc.)
  - Scientific inputs are prepared by the Preparatory Group (ECFA, CERN SPC, CERN GE-lab, American and Asian regions,…)
- Both groups are chaired by Scientific Secretary for ESS of CERN Council

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- Both groups are chaired by Scientific Secretary for ESS of CERN Council
- Timeline approved by the Council
  - **Open Symposium for community input, September 2012**
  - Strategy Group meeting for drafting, January 2013
  - Council discussion, March 2013
  - Special session of Council (presence of ministers), May/June 2013

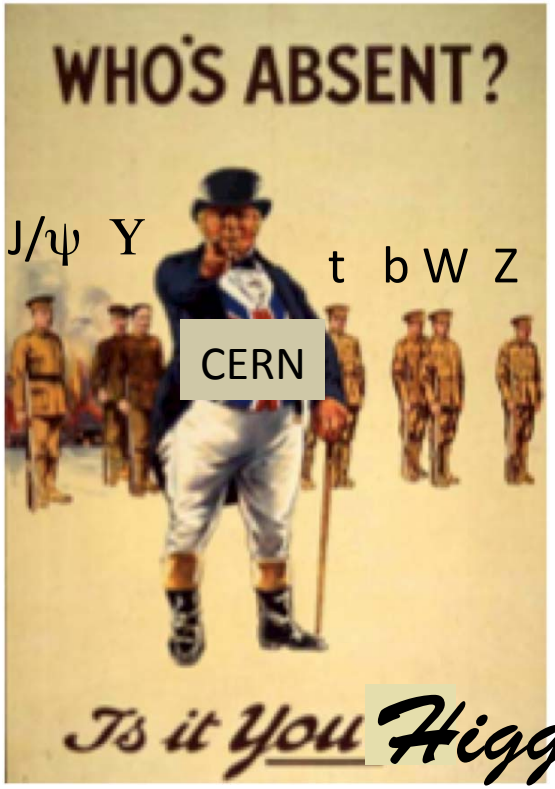
Summary

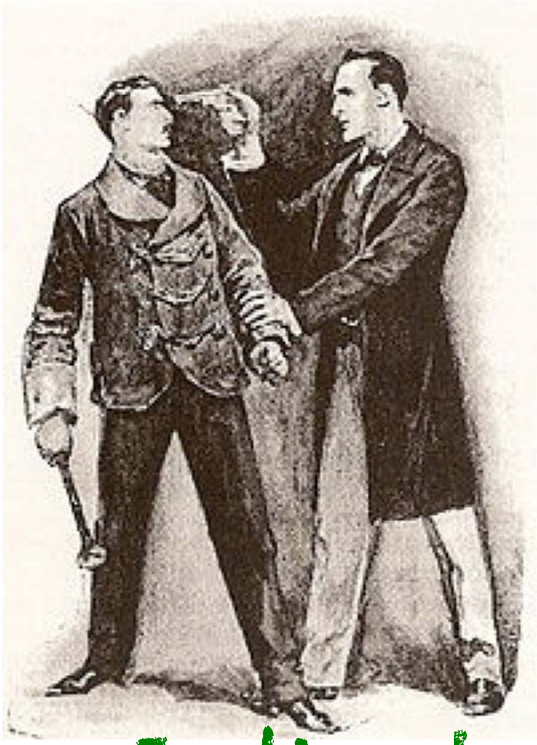
- In 2006, CERN Council has established Strategy for Particle Physics in Europe.
- Council is now resuming two roles: running the CERN Geneva Laboratory and setting up the strategy for European Particle Physics.
- In the definition and implementation of the strategy, not only the CERN Geneva Laboratory but also the European national laboratories are playing important roles.
- Implementation is monitored by the Scientific Secretariat chaired by Scientific Secretary. Making good progress.

Summary

- Strategy Session of Council initiated the update for the strategy: good occasion to reflect on the progress and consolidate the exiting strategy.

SUSY!





Indirect evidence please?