OPEN SYMPOSIUM ABSTRACTS

High Energy Frontier and Flavour Physics (I)

The session will summarize the present experimental status of high-energy frontier physics and of flavour physics, as well as precision frontier physics on fundamental symmetries. The objective of this session is to further the understanding of the current status on these subjects before discussing how to proceed, with the aim of finding new physics phenomena beyond the Standard Model in the broad particle physics context.

High Energy Frontier and Flavour Physics (II)

In this session options for future projects at the highest energies and major projects in flavour physics are discussed.

Based on the experimental status presented in the morning session, the first talk will summarize the present state of the exploration of physics at the Terascale, point out the most important open questions, which theoretical models are proposing the most promising solutions and which are the main physics observables to be measured in the future.

In the second talk, the opportunities and ideas for future collider facilities and their physics case for the above topics will be presented with different emphasis, in particular

- The LHC-HL physics programme
- Electron positron at the EWSB scale
- High-luminosity flavour programme
- R&D towards future high energy frontier (multi-TeV) hadron- and lepton colliders
- Other opportunities (depending on the received input)

The discussion session will be structured into several parts (depending on the received input) covering (not necessarily exclusively)

- Synthesis of the physics opportunities and their priorities
- LHC high luminosity upgrade
- Higgs factory
- LC at higher energies
- Flavour facilities
- Multi-TeV projects

Instrumentation, Computing and General Infrastructure

The science of future years relies on the vitality and success of research and development of today.

R&D in instrumentation has always been an important component of particle physics and a required driver for the discovery experiments of the future. In addition, particle physics has also stretched the boundaries of data intensive science to a global scale. The LHC experiments together with the worldwide GRID collaboration (WLCG) has demonstrated the power of an integrated computing infrastructure for data process and analysis.

We will examine the state of detector R&D in particle physics and the developments and challenges that face the field in computing. We will also examine the infrastructure required to do our science and the challenges of sustaining an experienced technical workforce and the large facilities required for detector construction.

Astroparticle Physics

In Europe, ApPEC (Astroparticle Physics European Consortium), associated with the Eranet ASPERA, coordinates research in Astroparticle Physics. These bodies have published a roadmap which contains the list of topics under consideration.

From this roadmap, the topics directly related to particle physics will be discussed in the session on Astroparticle Physics:

- Direct and indirect WIMP dark matter searches
- Axion searches
- Neutrino properties extracted from experiments searching for neutrino-less double beta decay
- Large underground detectors for the study of proton decay, low energy neutrino astrophysics and long baseline neutrino oscillations

Other topics related to neutrino physics will be discussed in the session on Physics of Neutrinos.

The talk Astroparticle Physics: status and open questions (C. Spiering) will give an overview of the situation in Europe. A short summary of the ApPEC roadmap will be given, with emphasis on the above topics, and including an overview of the input received from the community.

The second talk (M. Turner) will summarize the situation in the Americas and Asia and will discuss the organizational issues for interregional coordination such as the Astroparticle Physics International Forum (APIF) of the OECD Global Science Forum.

The ApPEC roadmap can be found at http://www.aspera-eu.org/.

Particle Physics Theory

The first talk will provide an overview of the various branches of particle physics theory, with some historical perspective. It will consider the role of particle theory within the field of particle physics and how it is currently organized, with comments for the future.

The second talk will review the spectrum of current problems in particle physics addressed with the methods of lattice quantum field theory; it will also comment on organizational aspects and on the role of Europe on the global scene in this field.

Both talks will take into account, if relevant, possible input submitted by the community.

The overall discussion at the end of the session may cover not only the subjects of the two talks but also: CERN synergies with regional/national/local theory groups, in Europe and in the rest of the world; relations with EU programmes; relations with experiment ("embedded" theorists, collaboration between experiment and theory to optimize analysis and presentation of experimental data, access by theorists to experimental data, …); development of software packages.

Accelerator Science and Technology

The aim of this session is to carry out an overview of the technical status of the main accelerator projects and related R&D needed in order to match the physics objectives in particle physics. The on-going activities, including main R&D achievements, as well as remaining critical issues will be discussed. In particular, the issue of the projects readiness for construction will be addressed and possible technically-driven schedules (i.e. when could the project be launched and how long would the construction last) will be discussed on purely technical grounds, even though the estimated cost of the projects will be presented whenever possible.

For the very long term, exploratory accelerator R&D that might extend the current frontiers of reachable energy and intensity will also be discussed.

Strong Instructions

In the session on strong interactions, an update will be given on the status and opportunities in this field.
In the first talk of this session an overview will be presented of the field of 'Strong Interactions and QCD at the High Energy Frontier'. Accurate QCD predictions are crucial for experiments at the LHC, in high energy cosmic ray studies, neutrino experiments and for future colliders. However, there are still many issues which require deeper theoretical understanding or more precise experimental input. Therefore, QCD studies remain an important part of the physics programs at existing and future facilities. The first talk will discuss open questions and present possible future options for QCD studies at fixed target and collider facilities, focusing on measurements which require the use of large infrastructures.

The second talk in this session will be devoted to Relativistic Heavy Ion Collisions. Experiments at the collider facilities RHIC at Brookhaven National Laboratory (USA) and at the LHC at CERN focus on exploring the properties of the quark-gluon plasma. At the energy frontier of the LHC, the abundant production of hard probes (heavy quarks and jets) will be used by the major experiments ALICE, ATLAS, and CMS to investigate fundamental questions such as the degree of deconfinement in and the transport coefficients of this new state of matter.
At lower energies, experiments will focus on matter at extreme baryon density and the search for a possible critical endpoint.
The experiments at the LHC will need significant upgrades in Pb-Pb luminosity to fully explore the physics potential of nuclear collisions at the high energy frontier. Third generation experiments in the regime of physics at high baryon density with very challenging luminosities are currently being discussed

at GSI/FAIR, Dubna, and the CERN SPS facility to address questions related to the QCD phase diagram in this regime.

Neutrino

The last CERN Strategy Process stated that it was essential to determine the value of theta13 to clarify the future experimental programme in neutrino physics. Experiments have continued to make rapid progress, and that clarity has now been achieved, with an experimentally-determined value of theta13 almost as large as the previous limit now known to roughly the same absolute accuracy as the other angles. This opens the prospect to determine the mass hierarchy and search for CP violation with new "conventional" long-baseline experiments. The first focus of the session will be on a discussion of the proposed experiments and where the European effort should be focussed. We will also discuss the longer-term strategy towards even more capable programmes and what R&D and other efforts are needed in the near term. We also need input on what support experiments (neutrino cross-sections, hadron production measurements, etc.) we should be preparing. There is also the question of short-baseline indications of sterile neutrinos, where the experimental situation has become more complex since the last strategy. We will discuss proposed experiments to address these questions and, once again, where European effort should be focussed. We will also discuss the important topic of absolute neutrino mass, which is coupled to the discussions in the astroparticle physics section.