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KEYNOTE4: High Energy Muon and Hadron Collider Projects within the overall future accelerator panorama

Thursday 31 August 2023 17:30 (1h 30m)

CHAired by: Dr.Nadia Pastrone (INFN-Torino, IT)

Abstract: Beyond the successful completion of the high-luminosity LHC, the ESPPU (European Strategy for Particle Physics Update) identified an $e+e$ -Higgs factory as the highest priority future collider, and tasked CERN to undertake a feasibility study for a hadron collider operating at the highest possible energies, with a Higgs factory as a possible first stage (FCC). China is developing a similar strategy with the CepC followed by the SppC high energy hadron collider. Linear collider Higgs factory options as ILC and CLIC are studied in parallel. An international muon collider collaboration addresses the challenges of constructing a future 3-10 TeV muon collider.

Although accelerator R&D is necessarily a long-term endeavour, the European LDG (Lab Directors Group) roadmap focuses on the shorter but crucial timescale of the next five-to-ten years. It concentrates on the five key objectives identified in the ESPPU: further development of high-field superconducting magnets; advanced technologies for superconducting and normal-conducting radio-frequency (RF) structures; development and exploitation of laser/plasma-acceleration techniques; studies and developments towards future bright muon beams and muon colliders; and the advancement and exploitation of energy-recovery linear accelerator technology.

This keynote will first describe the overall panorama of the future accelerators starting with the $e+e$ - Higgs factory options. The speaker will then expand on two main accelerators options that are also actively studied as part of the abovementioned accelerator roadmap: a high energy muon collider (3 to 10 TeV) and a high energy hadron collider at 100 TeV. A high energy Muon collider R&D is studied both in Europe and USA; a high energy hadron collider is studied both at CERN (FCC-hh) and in China (SppC). Both accelerator options are linked to the development of high field magnets; this is the subject of another keynote in this school. Besides, the introductory theoretical presentation by Carlos Wagner stresses the physics potential with these colliders, and the lecture by Nadia Pastrone will discuss the experimental set-ups needed to confront the new challenges imposed on the detectors of these colliders.

Lecturer: : Steinar Stapnes is a Professor at the Department of Physics of the Faculty of Mathematics and Natural Sciences at the University of Oslo (Norway). He is currently Linear Collider Study Leader and Research Scientist at CERN. He was deeply involved in the construction of the ATLAS experiment at CERN, where he acted as Co-Deputy Spokesperson. The last decade he has been involved on the development of future accelerators, primarily the CLIC high energy $e+e$ - linear accelerator project and ILC. He is leader of the International Muon Collider Collaboration Steering Group and member of the International Advisory Committee for the CepC project in China (text informed by the lecturer).

Presenter: Prof. STAPNES, Steinar (CERN (CH) and University of Oslo (NO))