



Séminaire du Laboratoire de l'Accélérateur Linéaire

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CERN

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The case for a high-energy e^+e^- circular collider for Europe

The strategy for future collider projects will be influenced strongly by the discoveries of the LHC. The discovery by ATLAS and CMS of a 125 GeV/c² boson in 2012 naturally focuses attention on concepts for a Higgs factory to study in detail the properties of this remarkable particle. Such a machine should be able to go significantly beyond the capabilities of the LHC and its upgrades for Higgs studies, as well as offering other physics possibilities. Circular electron-positron colliders are among the options that merit further study, for a fully-informed decision to be taken at the appropriate time. Options for Europe at CERN include LEP3 capable of collisions at energies up to ~240 GeV, that could be located in the existing 27 km LHC tunnel and TLEP a collider in a new 80km tunnel in the Geneva area that could reach centre-of-mass energies above the top threshold. The 80 km tunnel of TLEP would also provide a path towards much higher energies, e.g., it could later accommodate a very high energy LHC (VHE-LHC), with a centre-of-mass energy approaching 100 TeV in pp collisions.

I shall first briefly present tentative design parameters, and address novel concepts and accelerator-physics challenges for these two circular e^+e^- Higgs-factory colliders. Next, I shall go over the physics potential of these circular colliders, in particular for Higgs precision studies, and compare it to that of other options, e.g., to the International Linear Collider (ILC) and the Large Hadron Collider (LHC) prospects. In particular, the TLEP option will be able to reach the sub-percent precision for most Higgs boson couplings to gauge bosons and to fermions. This accuracy, needed for these measurements to become sensitive to new physics at and beyond the TeV scale, can be achieved with detector performance similar to those of the present LHC detectors. It will also allow unprecedented accuracies to be reached for all precision electro-weak measurements, and will determine with great precision the top quark properties. The cost-effective LEP3 option, which would re-use the existing tunnel and detectors, would be a very interesting back-up, should the world financial situation stay at a critical level. Finally, I shall conclude by discussing a possible plan of work, which needs to be set up for allowing the community to decide on the next large Particle Physics project in Europe in a timely and educated manner.

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Thé et café seront servis 1/4 h avant le séminaire



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