John Adams Institute for Accelerator Science

John Adams Institute for Accelerator Science Lecture Series

Thursday 1st November 2012 at 2:30pm

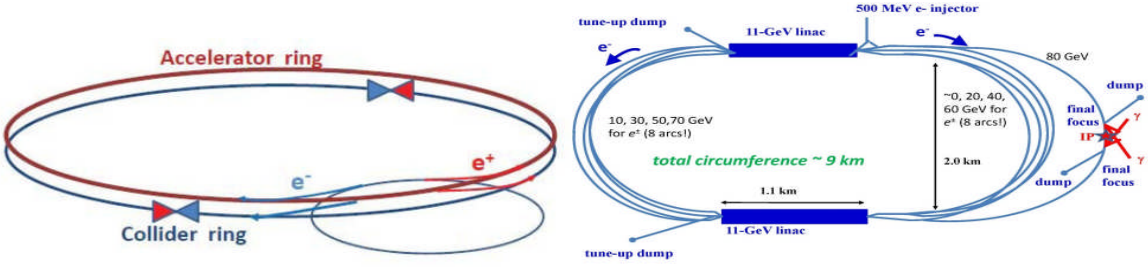
Fisher Room, Denys Wilkinson Building

Circular Higgs Factories: LEP3, TLEP and SAPPHIRE

The lecture will be delivered by

Dr. Frank Zimmermann (CERN)

Abstract: In 2012 two LHC experiments have discovered a new particle with a mass around 125 GeV, which might be the scalar Higgs boson of the Standard Model. This particle could be produced in large numbers for precision studies by an e^+e^- collider operating near the *ZH* threshold at a beam energy of 120 GeV or, in the *s*-channel, by a γγ collider with primary electron beam energies of 80 GeV. **In this seminar I will discuss tentative design parameters, novel concepts and accelerator-physics challenges for two circular e^+e^- Higgs-factory colliders – LEP3 and TLEP – and for a gamma-gamma Higgs-factory collider based on a recirculating SC electron linac – SAPPHiRE.** LEP3, installed in the existing 27-km LHC tunnel, and TLEP, in a new 80-km long tunnel, require – in addition to the collider ring – a fast cycling accelerator ring for quasi-continuous top-up injection to compensate the short beam lifetime due to radiative Bhabha scattering at luminosities above 10^{34} $cm^{-2}s^{-1}$. In addition, a large momentum aperture is needed to ensure an adequate beam lifetime with regard to beamstrahlung. The 80-km tunnel of TLEP could later accommodate a very high energy LHC ("VHE-LHC"), with a centre-of-mass energy approaching 100 TeV in *pp* collisions. An important challenge for SAPPHiRE is the layout of the interaction region and the generation of the high-power photon pulses needed for Compton back scattering. These photon pulses, which collide with the electron beams about 1 mm from the interaction point proper, could be produced either by a conventional laser together with an optical stacking cavity or, more intriguingly, by an FEL process, possibly driven by the 80-GeV electron bunches themselves. SAPPHiRE could be reconfigured as "LHeC" (or vice versa), providing a 60-GeV electron beam of higher current in energy-recovery mode to collide with one of the LHC hadron beams. SAPPHiRE could also be based on infrastructures and expertise available at DESY, FNAL, KEK or TJNAF.



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