Damping Rings and Ring Colliders Introduction

S. Guiducci, INFN-LNF

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Introduction

- The Damping ring lessons (A3.1 to A3.7) will be based on the slides presented at the 2010 school by Mark Palmer http://ilcagenda.linearcollider.org/materialDisplay.py?contribId=10&sessionId=5&materialId=0&confId=4480

  and at the 2009 school by Andy Wolski http://ilcagenda.linearcollider.org/materialDisplay.py?contribId=22&sessionId=3&materialId=1&confId=3475

- The slides for the A3.8 lesson on circular colliders are at https://ilcagenda.linearcollider.org/materialDisplay.py?contribId=28&sessionId=1&materialId=slides&confId=5636

Outline

- A3.1 - DR Basics: Introduction to Damping Rings
  - Role of the damping rings in the ILC accelerator complex
  - Review parameters and constraints of CLIC and ILC damping rings
  - Identify key challenges
- A3.2 - DR Basics: General Linear Beam Dynamics
  - Review the basic physics of storage rings including the linear beam dynamics
- A3.3 - LER Design: Radiation Damping and Equilibrium Emittance
  - Radiation Damping and Synchrotron Motion
  - Quantum Excitation and Equilibrium Emittance
  - Summary of Beam Parameters and Radiation Integrals
- A3.4 - LER Design: Damping Ring Lattices
  - ILC Damping Ring Design Optimization
  - The ILC DR Lattice, Parameters and Design Choices
  - CLIC Damping Ring Design Optimization
  - The CLIC DR Lattice, Parameters and Design Choices

Outline (contd)

- A3.5 – DR Technical systems
  - Review technical challenges of ILC and CLIC DR
  - Vacuum system and e-cloud mitigations
  - Damping wigglers
  - Injection/extraction kickers
- A3.6 – Beam Dynamics
  - Overview of Impedance and Instability Issues
  - Review of Selected Collective Effects
- A3.7 – R&D Challenges and Test Facilities
  - CESR-TA
  - ATF
- A3.8 – Circular Colliders
  - Basics of circular colliders
  - Luminosity and tune shifts
  - Beam lifetimes
  - Challenges of future colliders

Bibliography

- Recommended Accelerator Physics Texts:
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- Basic Documentation
  - ILC Reference Design Report, vol. 3 The Accelerator http://ilcdoc.linearcollider.org/record/6321/files/ILC_RDR_Volume_3-Accelerator.pdf?version=4
  - ILC A Technical Progress Reporthttp://ilcdoc.linearcollider.org/record/32863/files/ilc_interim_report_2011-lores.pdf
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  - M.E. Biagini, W. Chou eds., e^+e^- Colliders: Past and Present Experiences and Future Frontiers, ICFA Beam Dynamics Newsletter 48, April 2009 http://icfa-usa.jlab.org/archive/newsletter/icfa_bd_nl_48.pdf