ILC Damping Rings Research and Development Objectives

Very High Priority

2.1.1.1 Lattice design for baseline positron ring

2.1.1.2 Lattice design for baseline electron ring

2.1.4.3 Demonstrate < 2 pm vertical emittance

2.2.1.2 Characterize single-bunch impedance-driven instabilities

2.2.3.1 Characterize electron-cloud build-up

2.2.3.2 Develop electron-cloud suppression techniques

2.2.3.3 Develop modeling tools for electron-cloud instabilities

2.2.3.4 Determine electron-cloud instability thresholds

2.2.4.1 Characterize ion effects

2.2.4.2 Specify techniques for suppressing ion effects

3.5.1.1 Develop a fast high-power pulser for injection/extraction kickers

High Priority

2.1.1.5 Lattice design for injection/extraction lines

2.1.1.6 Optics designs for injection/extraction sections in damping rings

2.1.2.1 Characterize damping rings acceptance

2.1.2.2 Optimize the damping rings acceptance

2.1.2.3 Specify magnet field quality required to ensure good acceptance

2.1.4.1 Develop strategies for low-emittance tuning

2.1.4.2 Specify requirements for survey, alignment and stabilization

2.1.4.4 Specify support schemes for damping rings magnets

2.1.4.5 Specify orbit and coupling correction scheme

2.2.1.1 Develop single-bunch impedance models

2.2.2.1 Develop long-range wakefield models

2.2.2.2 Characterize multi-bunch instabilities

2.2.2.3 Characterize the effects of injection transients

3.1.1.1 Specify vacuum chamber material and geometry

3.1.1.2 Develop technical designs for principal vacuum chamber components

3.1.1.3 Characterize vacuum system performance

3.4.6.2 Develop engineering designs for damping wigglers

3.5.1.2 Develop physics designs for kicker striplines

3.6.1.1 Specify 650 MHz RF system

3.6.1.2 Prototype complete 650 MHz RF unit and test at high power

3.6.2.1 Develop conceptual design for 650 MHz RF cavities, cryomodules and supporting hardware

3.6.2.2 Develop engineering design for 650 MHz RF cavities, cryomodules and supporting hardware

3.6.4.1 Develop RF controls

3.7.2.2 Develop feedforward for extraction kicker stabilization

3.7.3.4 Develop instrumentation for monitoring emittance damping

3.7.6.1 Specify overall requirements for instrumentation and diagnostics

3.10.1.2 Specify support and stabilization hardware

3.13.1.1 Develop integrated mechanical design

Moderate Priority

2.1.1.3 Lattice design for alternative positron ring

2.1.1.4 Lattice design for alternative electron ring

2.1.3.1 Develop techniques for optics measurement and correction

2.2.5.1 Characterize space-charge effects

2.2.5.2 Estimate the impact from CSR

2.2.5.3 Estimate emittance growth from IBS

2.2.5.4 Determine the Touschek lifetime

2.3.1.1 Perform integrated beam dynamics simulations

3.1.4.1 Specify vacuum valves

3.3.2.1 Develop physics designs for main dipoles

3.3.3.1 Develop physics designs for quadrupoles

3.3.4.1 Develop physics designs for sextupoles

3.3.5.1 Develop physics designs for higher-order multipoles

3.3.6.1 Specify steering magnets

3.3.7.1 Specify skew quadrupoles

3.4.6.1 Develop physics designs for damping wigglers

3.5.1.3 Develop engineering designs for kicker striplines

3.7.1.1 Develop beam lifetime instrumentation

3.7.1.2 Develop fast loss monitors

3.7.2.1 Develop beam position monitors

3.7.3.1 Develop high-precision beam size monitor

3.7.3.2 Develop precision bunch-by-bunch beam size monitor

3.7.3.3 Develop instrumentation for measuring injected phase space

3.7.3.5 Develop fast coupling monitor

3.7.4.1 Develop coherent signal receivers

3.7.5.1 Develop tune monitors

3.7.5.2 Develop instrumentation for fast dispersion measurements

3.8.1.1 Specify bunch-by-bunch feedback systems

3.8.1.2 Model bunch-by-bunch feedback systems

3.8.1.3 Develop bunch-by-bunch feedback systems

3.10.1.1 Specify alignment techniques appropriate for different sections of the rings

Low Priority

3.1.2.1 Specify vacuum pumps

3.1.3.1 Specify vacuum diagnostics and controls

3.3.2.2 Develop engineering designs for main dipoles

3.3.3.2 Develop engineering designs for quadrupoles

3.3.4.2 Develop engineering designs for sextupoles

3.3.5.2 Develop engineering designs for higher-order multipoles