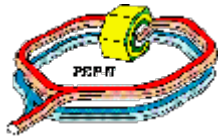


ILC Damping Ring Test Possibilities

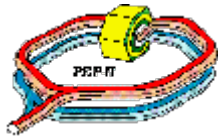
John T. Seeman

SBF Workshop

SLAC

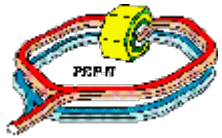
June 15, 2006

Parameters of Super-B Designs



Collider		ξ_y	N	β_y*	s	E	F	Lumin
Units			10^{10}	mm	m	GeV	(~Hd)	10^{35}
PEP-II	Normal	0.07	8	10	1.26	3.1	0.84	0.11
KEKB	Normal	0.065	5.8	6	2.1	3.5	0.76	0.16
Super-PEP-II	High I low βy	0.12	10	1.7	0.32	3.5	0.81	7
Super-KEKB	High I low βy	0.28	12	3	0.59	3.5	0.85	8
Linear SuperB	Single pass	29.	10	0.5	250	4	1.07	10
SuperB	Bunch shorten	0.14	6	0.4	0.63	4	0.75	10
SuperB	X'ing angle	0.045	2	0.08	0.5	5	0.8	9

ATF-II KEK

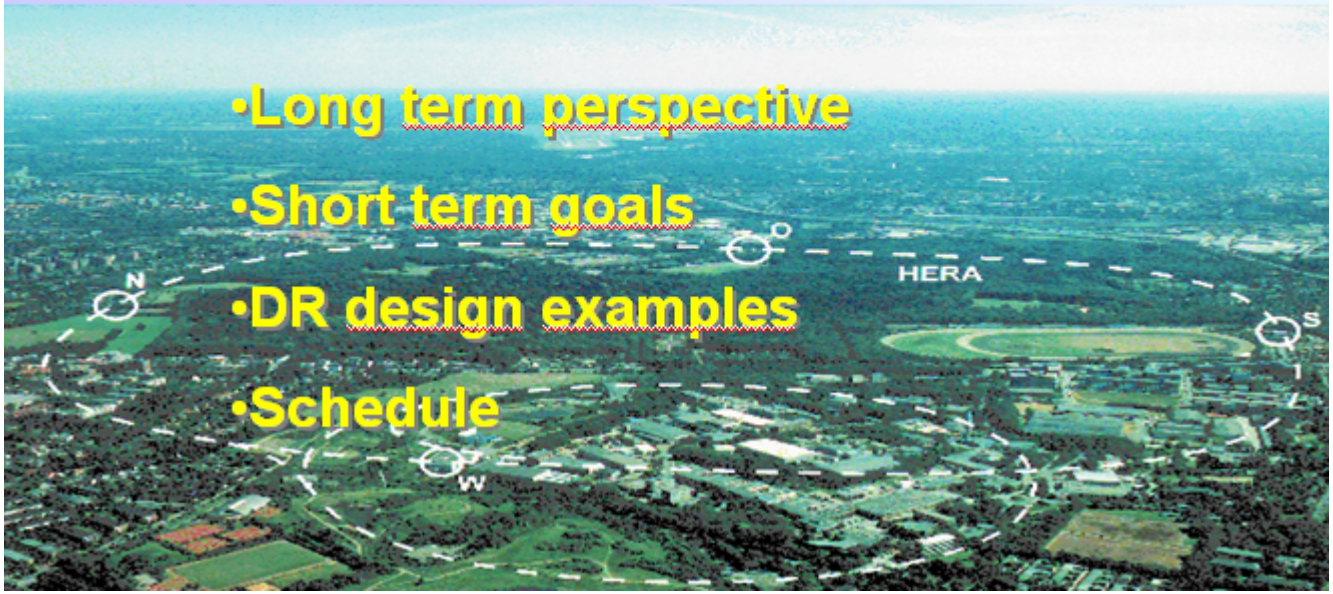


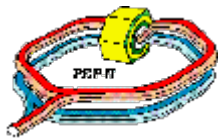
- Small emittances
- Low repetition rate
- Final focus under construction

The use of the HERA Electron Ring in Conjunction with ILC Damping Rings

Damping Ring Collaboration Meeting May9, 2006

F. Willeke, DESY





ILC Damping Rings

Most challenging accelerator problem:

- Very large beam currents (0.5A)
- Very small equilibrium emittance 1pm
- Strong damping
- Fast kickers required
- Strong transient beam loading
- Very broadband feedback systems
- Operation with high intensity positrons …

The challenging issues are coupled

(small emittance & high intensity)

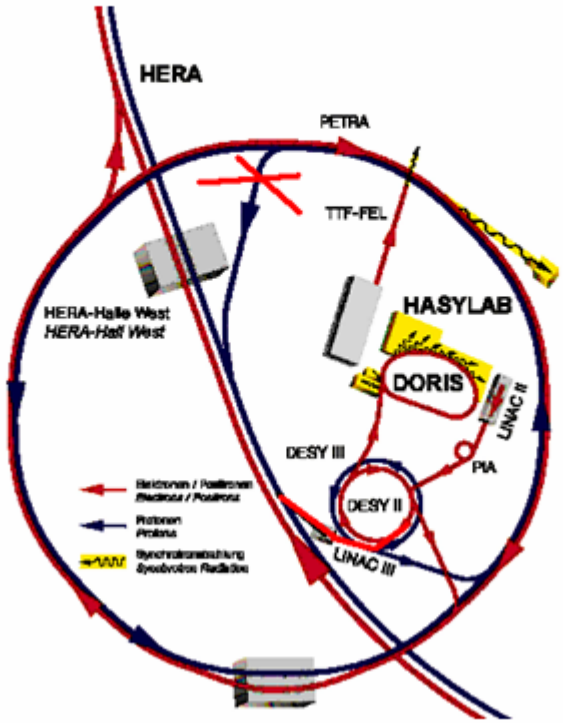
There is a non-negligible risk that it might be difficult achieve

The performance goal of the damping rings.

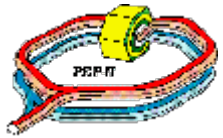
Need design margins, impacts on cost, …

Decision on the size of the damping rings: 6 km (Snowmass 05)

New HERA-Injector needed



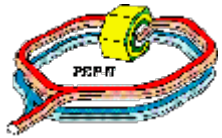
HERA e- ring for ILC



Example Parameter Set

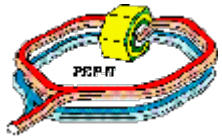
Parameter	unit	HERA Example 1	HERA Example 2	BD DR
Beam Energy	[GeV]	5	5	5
Circumference	[m]	6335.826	6335.826	6114
Harmonic Number	-	10560	10560	
RF Frequency	[MHz]	499.7	499.7	650
Arc- Optics	-	FDODF	FODO	FODO
Wiggler field	[T]	0.8	0.9	0.5
Wiggler active length	[m]	122.24	122.24	266
Norm. horiz. emittance	[μm]	2.48	3.26	5.6
Norm. Vertical emittance	[μm]	0.0	0.02	0.02
Hor. Damping Time	[ms]	16.4	13.8	14
Vert. Damping time	[ms]	16.4	13.8	14
Long. Damping time	[ms]	8.2	6.9	7
Dynamic Aperture	[rad·μm]	to be calc.	20	0.12
Bunch length	[mm]	0.8	0.6	6
rms energy spread	$[10^{-3}]$	1.2	1.02	1.3
RF Voltage capability	[MV]	40	40	19.3
Momentum compaction	$[10^{-4}]$	1.06	4.6	1.62
Energy Loss per Turn	[MeV]	3.23	3.84	14.3
RF Power for 0.5A	[MW]	1.61	1.92	1.4

Proposal: CESR ILC DR Test



- Use CESR after March 2008 as an ILC DR test
- Circ = 743 m.
- 1.5 to 5 GeV
- Lattice designed to make Horiz emittance less than 3 nm at 2 GeV; 15 pm vertical
- 400+ mA e+ or e-
- 366 bunches
- 6 to 8 nsec spacings
- 12 wigglers at 1.2 T field
- 6.9 mm bunch length

PEP-II HER



- **Emittance versus energy (Nosochkov):**
  - 9 GeV: 48 nm emit x, 8.8 mm bunch length
  - 7 GeV: 29 nm emit x, 6.0 mm bunch length
  - 5 GeV: 14.8 nm emit x, 3.6 mm bunch length
  - 3 GeV: 5.34 nm emit x, 1.7 mm bunch length
  - Wigglers will reduce these values