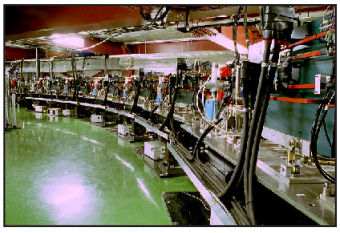
X-Band LC Damping Ring

The KEK-ATF has demonstrated the production of stable, low-emittance beams for an X-band linear collider

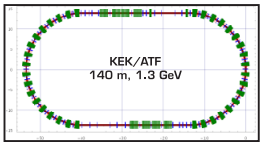
The specified vertical emittance of 5 pm has been shown at the LBNL-ALS and is achieved routinely at the KEK-ATF

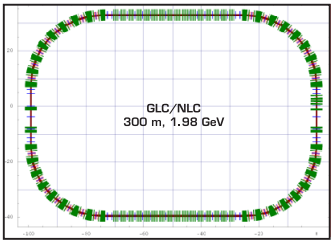
The KEK-ATF and third generation synchrotron light sources have resolved many engineering and accelerator physics issues:

- The required alignment tolerances and stability can be achieved
- The necessary diagnostics are within present capabilities
- Collective effects, such as Intrabeam Scattering, have been studied, and models validated
- Extraction kickers have been demonstrated



Inside the ATF Damping Ring





Electron Cloud Effect

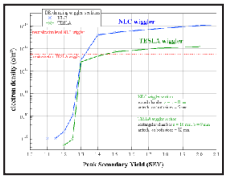
The electron-cloud effects through the Damping Rings to the Interaction Point have been evaluated

Build up of the electron cloud will be prevented by treating the vacuum chambers

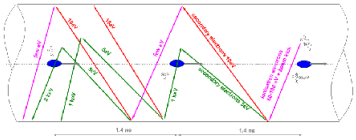
Investigations of surface treatments include:

- Measurement of the secondary electron yield of TiN and TiZrV NEG thin film coatings
- Testing the effectiveness of electron or ion conditioning
- Fabrication of specially grooved chamber surfaces

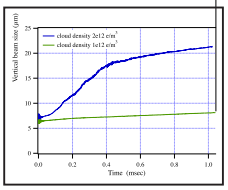
A demonstration chamber will be installed in PEP-II



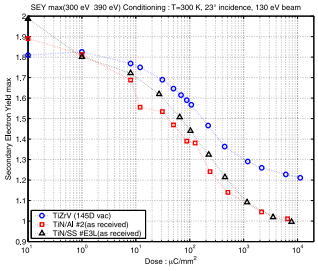
Simulation of Electron Cloud as a Function of Secondary Electron Yield in GLC/NLC and TESLA DR Wigglers



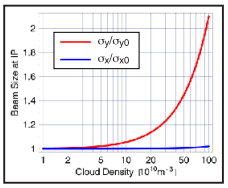
Schematic of Electron Cloud Generation



Simulation of Single-bunch Beam Instability from Electron Cloud in GLC/NLC Damping Ring

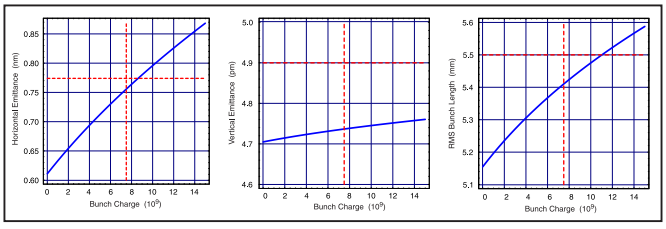


Measurements of Effect of Electron Conditioning on TiN and TiZrV Coatings

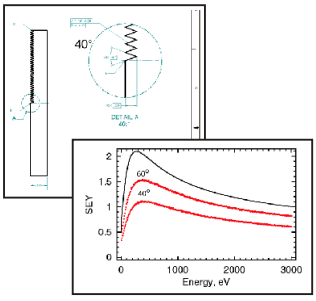


Simulation of Beam-size Blow-up at the IP as a Function of the Cloud density in the Beam Delivery System

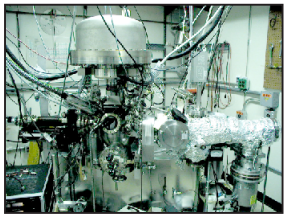
	ALS	SLS	ATF	GLC/NLC	TESLA
Circumference (m)	200	290	140	300	17,000
Energy (GeV)	1.9	2.4	1.3	1.98	5
Emittance x (nm), y (pm)	6, 5	4.8, 15	1.2, 4.5	0.61, 4.9	0.8, 1.4
Bunch Charge (10^{10} e⁻)	0.6	0.5	0.9	0.75	2.0
Impedance (Z/n) [mΩ]	80	200	600	<600	<60
Sextupole Alignment Sensitivity (μm)	30	70	50	55	10
Quadrupole Rotation Sensitivity (μrad)	200	370	870	500	40
Kicker Rise/Fall Time (ns)	n/a	n/a	65	65	20



Simulation of IBS emittance growth in the GLC/NLC, using models validated at the KEK-ATF. The broken red lines show the specified parameter values.



Analytic Estimate of Effect of Specially Grooved Chamber Surface on Secondary Electron Yield



SLAC Apparatus for Precise Measurement of Secondary Electron Yield