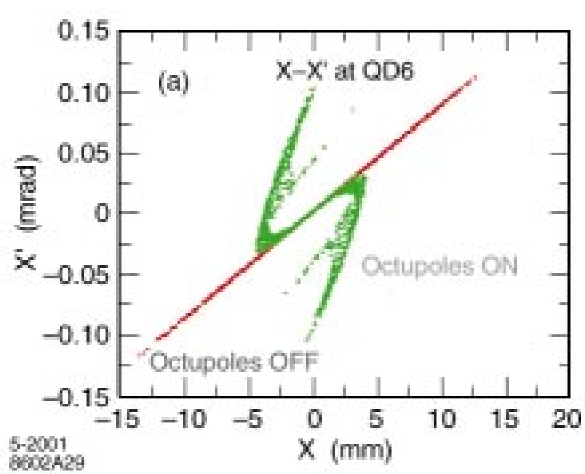
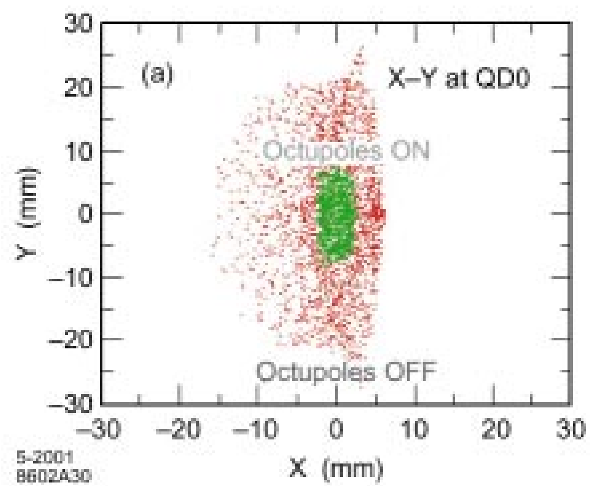
• Collimation design (minimization of secondary particle production, spoilers for muons, collimator survivability,…)

• Magnetic optics

"Folding" of beam by octupole doublets. Interaction with collimation requirements?

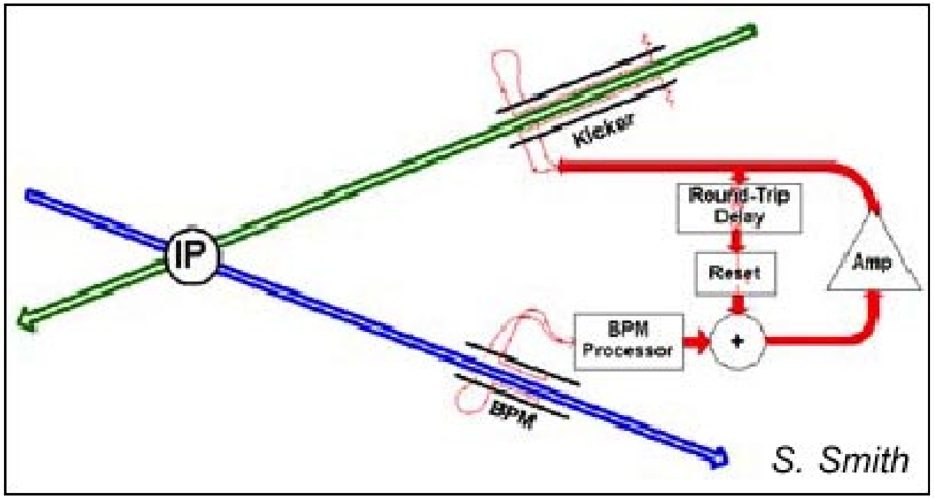




• Feedback systems (example of a university group's contribution to machine R&D: P. Burrows, G. White, S. Smith, Oxford):

Status of NLC fast (intra-train) feedback

(reported by Philip Burrows and Glen White, 10/5/01, CERN, see also note LCC _ 0056 03/01, Steve Smith)



Initial offset	Start of steering	Full luminosity	
8 nm (3 σ_y)	after 36 ns	after 42 ns	(16 % of bunches)
100 nm (37 σ_y)	after 36 ns	after 120 ns	(45 % of bunches)

Beneficial for NLC and CLIC as well but not sufficient.

32

What is the origin of the beam halo?

• Calculations for all machines indicate a beam halo (due to beam-gas scattering and other known sources) at the level of 10^{-6} of the beam core population. SLC experienced a beam halo of 10^{-2} to 10^{-4} on its best days.

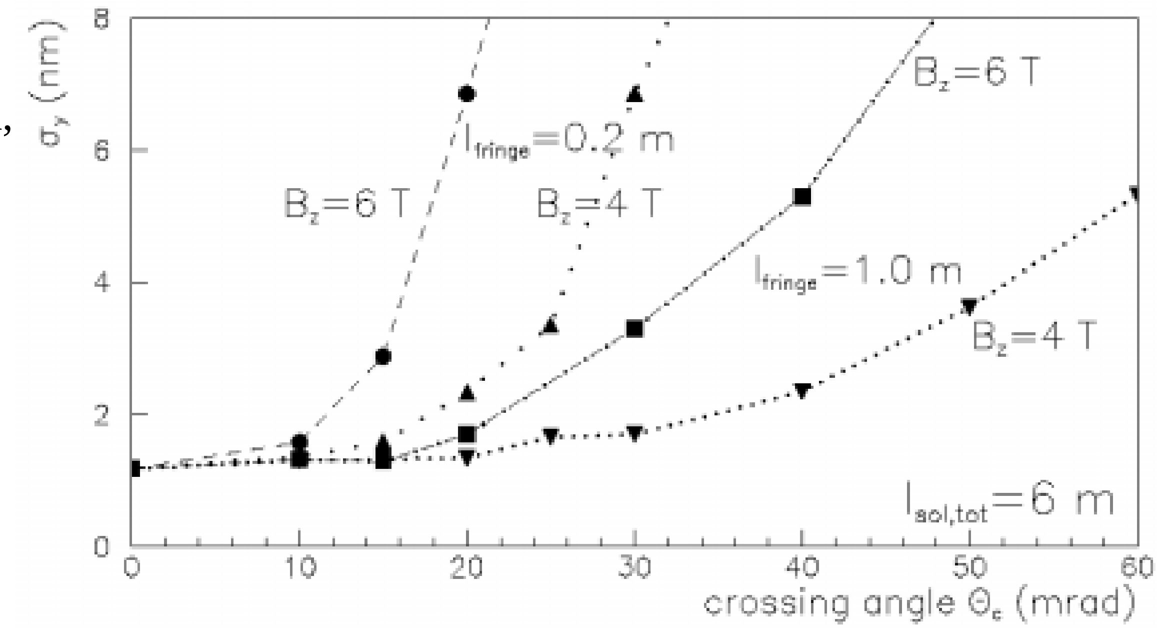
• Candidates include wake field distortions of the bunch phase space, dark current in the linac and uncollimated tails from the damping ring.

• The tails are a major source of background (through SR, secondary muons,...) and **must** be understood.

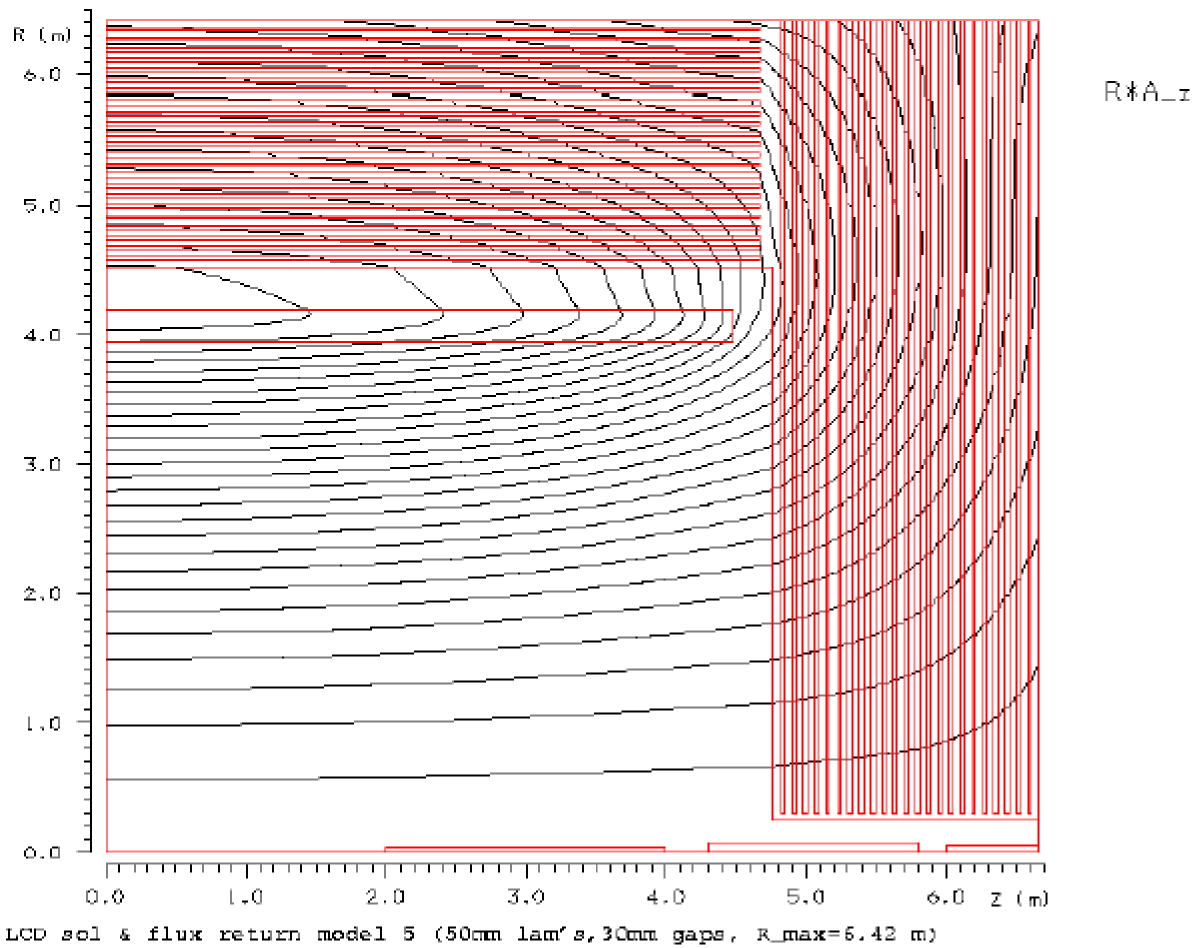
Effect of detector solenoid on luminosity

• Solenoid end fields cause the beam to radiate SR and blow up the vertical beam size at the IP. Detector solenoid must be designed taking this in account.

D. Schulte, F. Zimmermann, PAC01



NLC LD field map



Estimate of solenoid end-field effect

$$\Delta\sigma_y^{*2} = \frac{55}{24\sqrt{3}} r_e \lambda\!\!\!^{-}_e \frac{1}{20}\left(\frac{\gamma B_z \theta_c L}{2B\rho}\right)^5 \left[1 + 5\left(\frac{L}{l_{\text{fringe}}}\right)^2\right], \quad L = \text{Min}(L^*, L_{\text{sol}}/2)$$

Parameter designation			1a	1b	2a	2b	3a	3b	4a	4b
Central solenoid field	B_z	T	2		3		5		4	
Crossing angle	θ_c	mrad	6		20		20		20	
$\text{Min}(L^*, L_{\text{sol}}/2)$	L	m	1.8		3.8		1.9		2.0	
Solenoid fringe field length	l_{fringe}	m	1.0	0.3	1.0	0.3	1.0	0.3	1.0	0.3
Increase in σ_y^{*2} (from Eq. 1)	$\Delta\sigma_y^{*2}$	nm^2	1.3×10^{-5}	1.3×10^{-4}	7.1	77	0.74	7.8	0.34	3.7
Nominal squared beam size	σ_y^{*2}	nm^2	9.0		9.0		9.0		6.25	

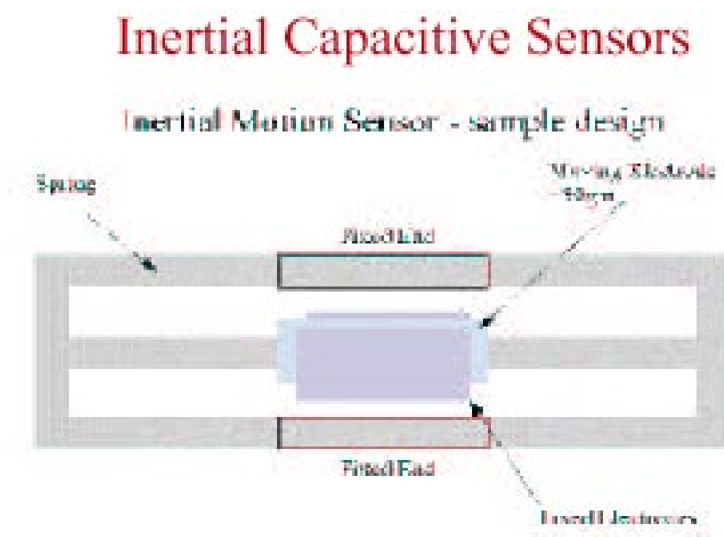
Reduction of local neutron (and other) backgrounds

- Design of luminosity monitors
- Low-*Z* absorbers
- Shielding design
- Why so many neutrons in TESLA detector when crossing angle should help?

IP magnet stabilization

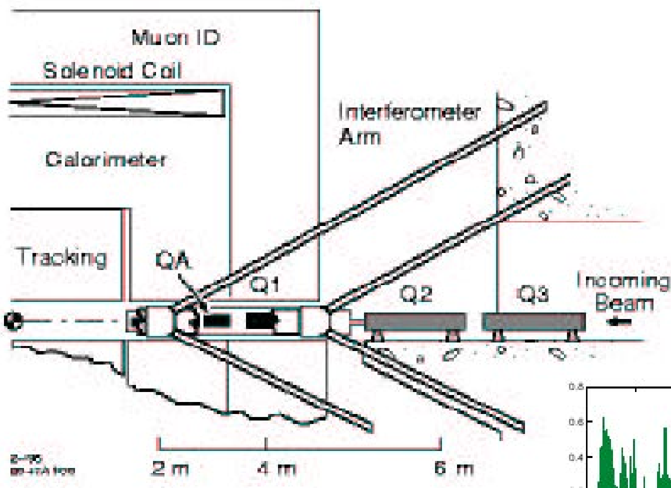
- mechanical supports
- locally generated noise (cooling, detector,…)
- active feedback (optical anchor or inertial feedback)

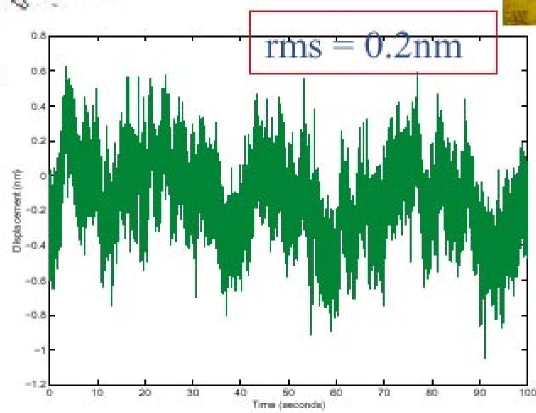
Inertial stabilization tests at SLAC:



NLC - The Next Linear Collider Project

Optical Anchor R&D





Measured Displacement over 100 seconds

T. Markiewicz, Snowmass 2001 presentation