Key Lessons from SLC

Controls, Instrumentation and Feedback

Automated diagnostics and tuning

Successful multi-loop beam-based feedback

On-line modeling and analysis

Beam-beam control and tuning

Emittance preservation and BNS damping

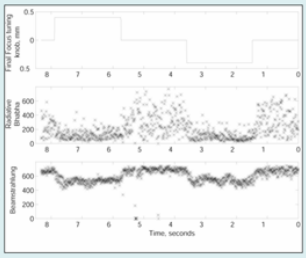
Management of large RF systems for stable acceleration

Luminosity Optimization Feedback used in linac and IP

Final Focus Optics parameters are changed small amounts to quickly ascertain the optimal setting.

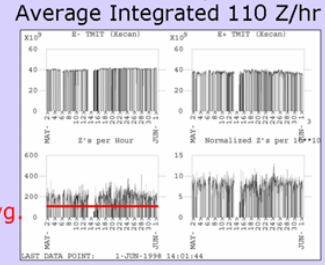
Control is moved ±δ from nominal

Measured Luminosity

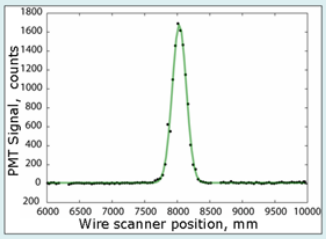


Instantaneous Luminosity History
1 month SLC operation
Average Integrated 110 Z/hr

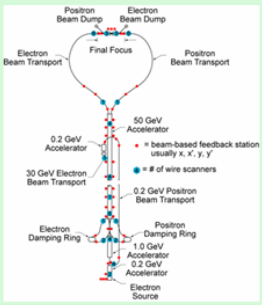
Avg.



Linac wire scans used to verify steering procedures and optimize emittance bumps



Feedback and Wire Scanner Locations



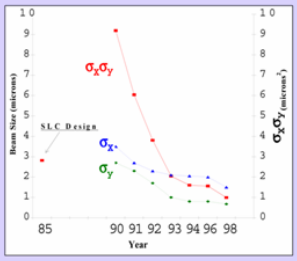
SLC

A Test Bed for all NLC Systems

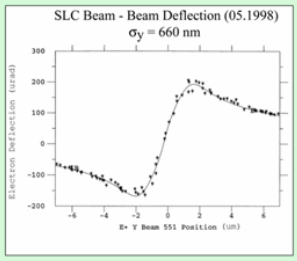
NLC-Relevant Systems:

- **Linacs**
  - **50 GeV S-band Linac**
- **Sources**
  - **80% Polarized e- source**
  - **High-power e+ target**
- **Damping Rings**
  - **Stabilized fast (50 ns) injection and extraction**
  - **Sub-ps phase synchronization with linac RF**
- **Beam Delivery**
  - **Final Focus, 2nd Order Chromatic Optics**
  - **Collimation**

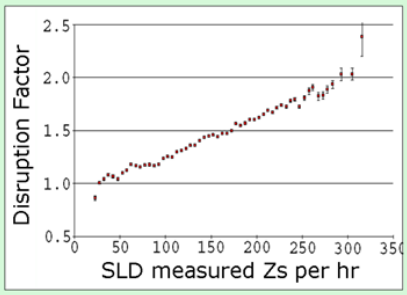
SLC Beam Size Reduction
1990 – 1998
The design was flexible enough to allow spot reduction well beyond the design.



SLC Beam-Beam Deflection:
The primary SLC collision optimization tool



Beam – Beam disruption:
the ratio of actual luminosity to that expected from beam size and intensity measurements.
It is well matched to SLC predictions.



SLC 1992 – 1998 Integrated Luminosity