The Next Linear Collider

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THP35,36,37
X-band Linear Collider Stabilization

Josef Frisch, Valentin Decker, Eric Doyle, Linda Hendrickson, Thomas Himel, Thomas Markiewicz, Tor Raubenheimer, Andrei Seryi: SLAC

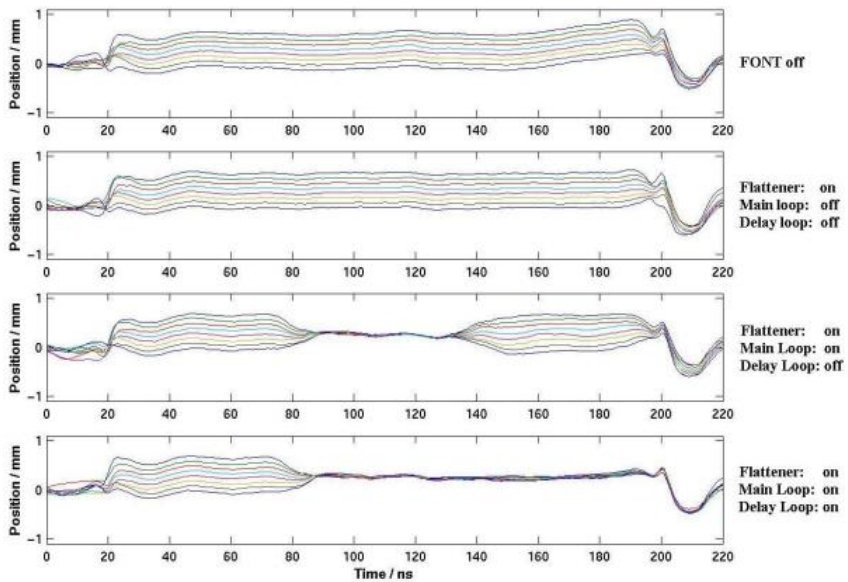
Allison Chang, Richard Partridge: Brown Univ.

Phillip Burrows, Stephen Molloy, Glen White: Queen Mary University

Colin Perry, Oxford University

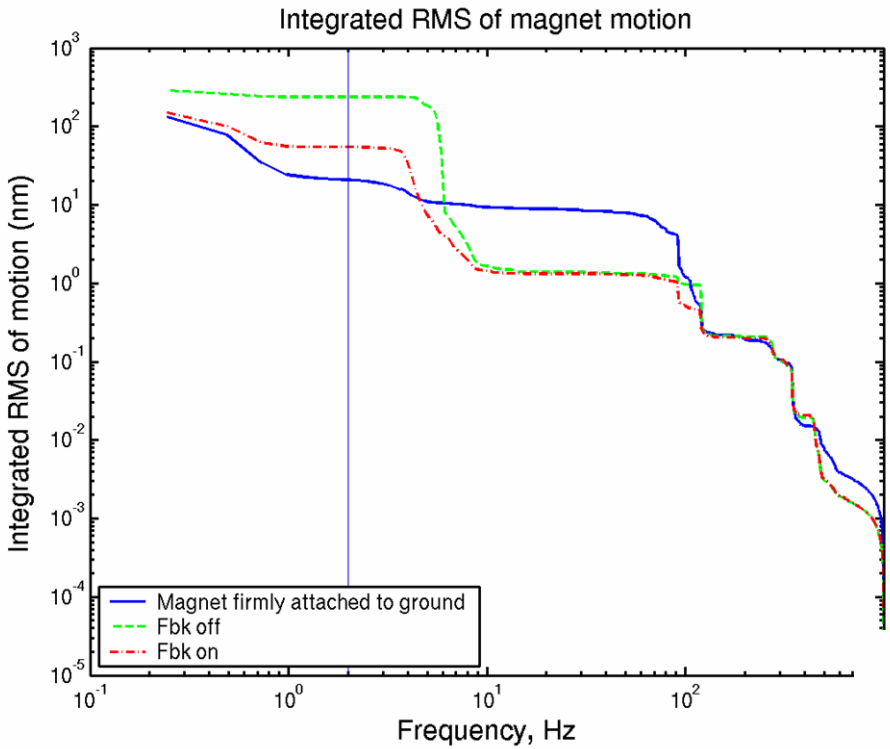
THP-37: Approaches to Beam Stabilization in X-band Linear Colliders

- Simulated ground motion in linac, based on measured noise at SLAC
- Measured performance of final doublet stabilization system.
- Calculation based on measured time delay of FONT intra-train feedback
- Get 93% nominal luminosity.



THP-36: Vibration Stabilization of a Mechanical Model of an X-band Linear Colldier Final Focus Magnet

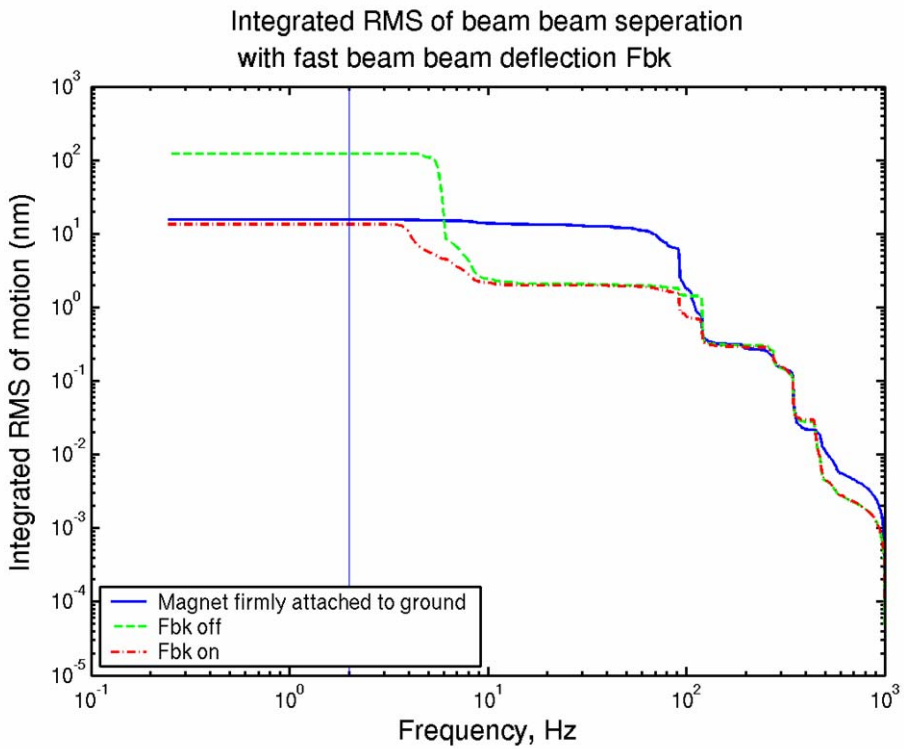
- Constructed mechanical mock-up of final focus
- DSP-based active feedback
- Tested in noisy location



Suspension system attenuates high frequencies,
But amplifies low frequencies.

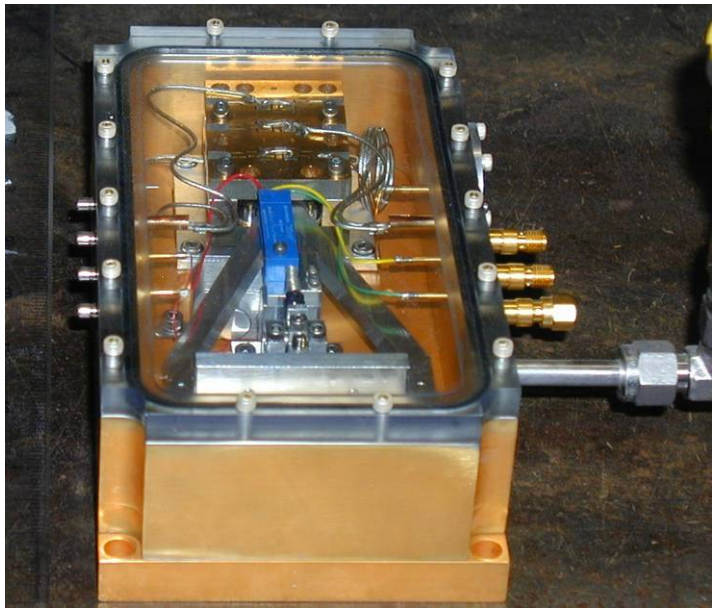
Active feedback damps low frequencies.

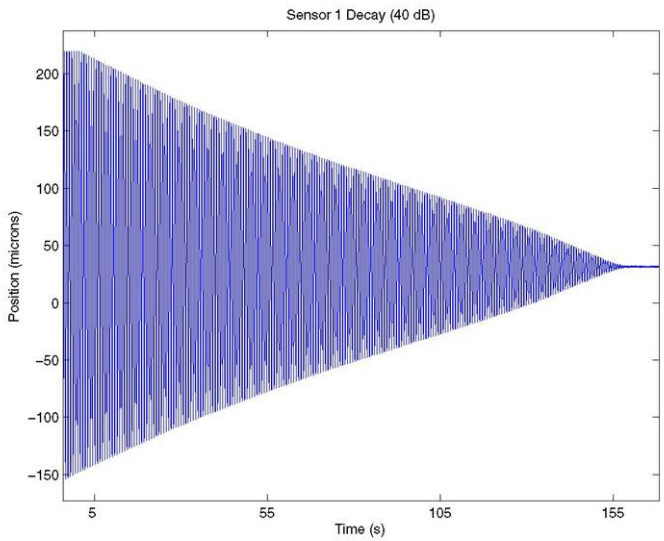
Beam-beam feedback corrects residual low frequency motion

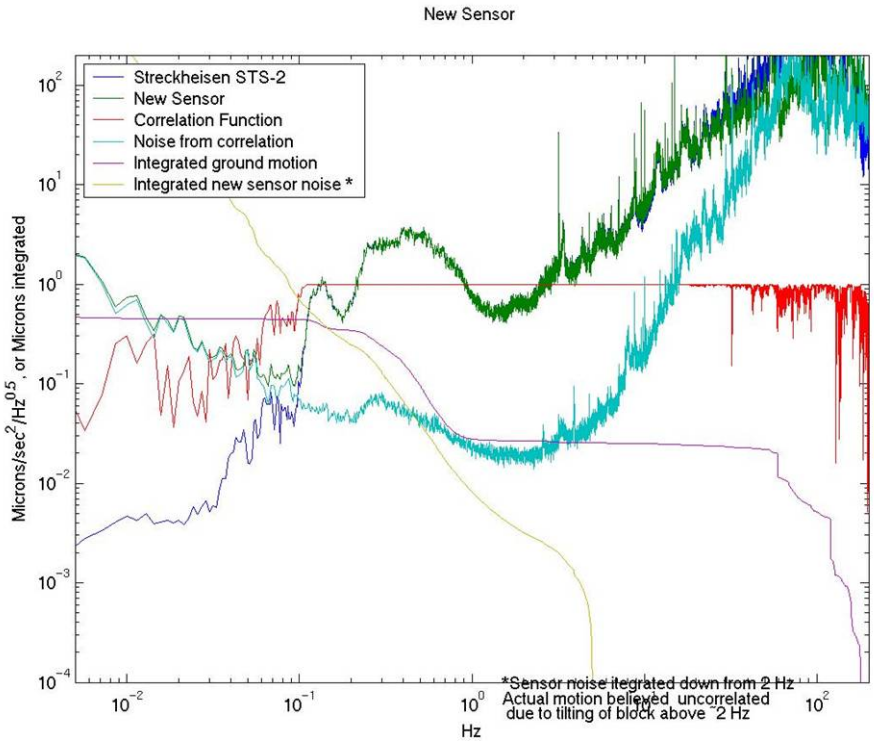


THP-35: Development of a Non-Magnetic Inertial Sensor for Vibration Stabilization in a Linear Collider

- Test stabilization system used commercial magnetic geophones – not suitable for use in a physics detector solenoid.
- Developing a non-magnetic, low noise sensor.
- First prototype has noise better than the sensors used for stabilization test




Sensor 1 Decay (40 dB)
Position (microns)
Time (s)
200
150
100
50
0
−50
−100
−150
5
55
105
155


New Sensor
Streckheisen STS-2
New Sensor
Correlation Function
Noise from correlation
Integrated ground motion
Integrated new sensor noise *
Microns/sec^2/Hz$^{.5}$, or Microns integrated
Hz
*Sensor noise itegrated down from 2 Hz
Actual motion believed uncorrelated
due to tilting of block above ~2 Hz

Stabilization Overall

- Measured time delay of Font, noise of stabilization system gives OK luminosity.
- Measured performance of prototype vibration sensor better than sensors used for stabilization experiment.
- Expect improvements in FONT and Vibration stabilization system performance.