Specifics of the Detector Hall Noise, SLD Data

Marty Breidenbach, Andrei Seryi
SLAC
Specifics of the detector hall noise
SLD data

Marty Breidenbach, Andrei Seryi
SLAC

The 22nd Advanced ICFA Beam Dynamics Workshop
on Ground Motion in Future Accelerators
November 6-9, 2000, SLAC

Specifics of interaction region of a linear collider

- **Tight space** allowance inside the detector
- **Impossible** to make **good supports** for final quads
- **Additional Noises** produced by **detector**
- **Possibly**, noises occurring **inside the final quads**
- ...

- Study noises in **SLD** (SLAC Large Detector) to get an idea about the scale of the problem...
• Study vibration produced by
  – compressor stations
  – building ventilation
  – detector electronics
  – detector cooling water, etc.

• Study motion on pit floor, in FF tunnels, on detector, on SC triplet (with SLD doors open), on girders

• Plan to measure SC triplet vibrations with SLD door closed (when the triplet is optimally supported)
  – will help to evaluate efforts to/lessons from the IR-FF test facility

8 seismometers installed in SLAC SLD pit, in Final Focus tunnels, on the SC triplet and on the detector were used in our studies.

M.Breidenbach, A.Seryi

• Noise level at SLD is higher than in quietest location at SLAC, but

• Most of dangerous high frequency motion comes from sources located in or near SLD building - under our control?

• Noises due to traffic and external (from SLAC) cultural sources do not contribute significantly to high frequency part f >6Hz

M.Breidenbach, A.Seryi
SLD GM&V Studies

• Major noise source in the SLD area is the building ventilation and water pumps
• Noise spectra varies significantly over short distance
• The SLD area, after proper engineering, or a similar site, would be compatible with a linear collider having nanometer scale beam sizes

Probes under SLD, 14m separation
• Noise level depends sharply on location, this is manifested by
  – differences of spectra
  – nonzero Imaginary part of correlation
• Impossible to model by only $P(\omega, k)$ spectrum!

Floor noise in SLD pit and FF tunnel mostly affected by building ventilation and water compressor station (+1001 of other smaller noise sources)

Almost no sharp lines in spectra => most of local sources OFF
SLD GM&V Studies, noise on SLD

• Noise on the SC triplet ~10 times larger (SLD doors open)
• **Does not** noticeably depend on compressors, building ventilation, etc.
• Mostly driven by on-SLD door mounted racks, pumps, etc.
• **Do not correlate** with ground, left and right triplets do not correlate
• Motion may be smaller if doors closed => triplet more properly supported. *(Plans to measure.)*
  Even so, motion is too big, need better engineering for NLC detector

---

**Conclusion and further plans**

• SLD-like area would not be that bad for a linear collider if
  – reengineer/replace noisy equipment
  – remove noise sources mounted on SLD detector

• Plans
  – measure triplet vibrations with SLD door closed
  – test prototype of different (better) supports of the triplet

• In longer term (???)
  – SLD area as test bench for active/passive, feedback/feedforward methods of stabilization of the linear collider final quadrupoles