

# Vibration Correlations: SLD Detector Hall

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# Overview

- Motivation
  - Correlation of vibrations over detector hall has implications for vibration requirements near IR
  - Correlation depends on local soil characteristics and on hall construction
- Goal
  - Measure vibration correlations at SLD and CERN “Point 4”
  - Fold into ILC MDI vibration requirements

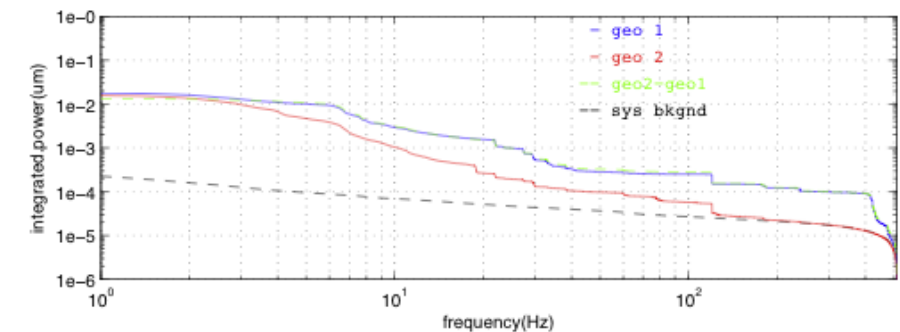
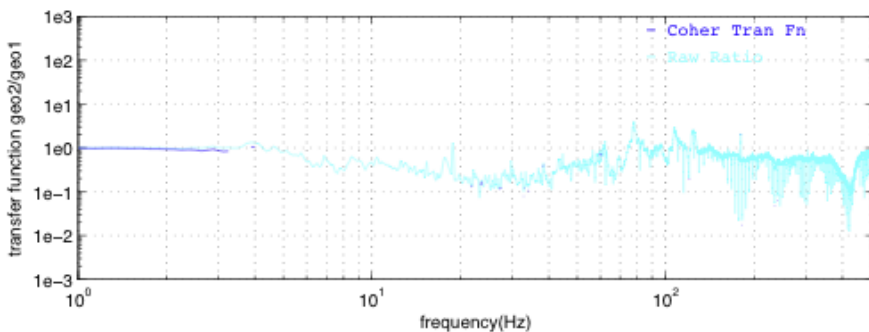
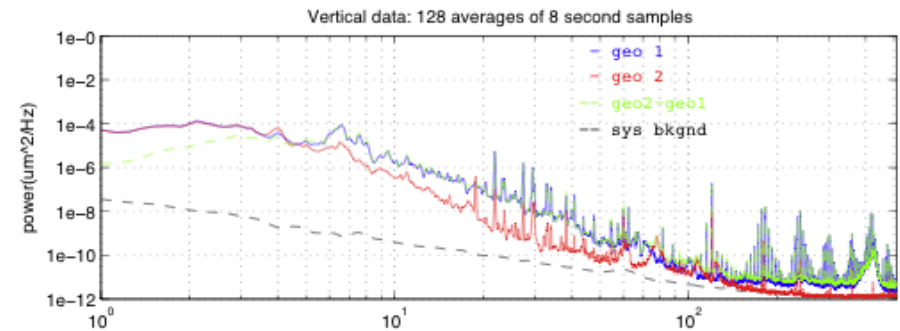
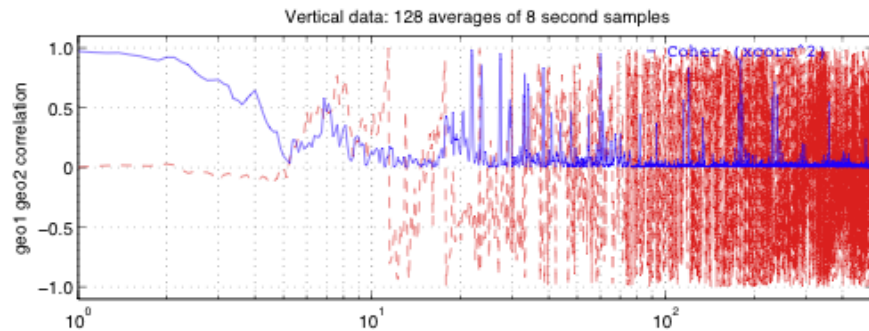
# Setup at SLD

- Vertical geophones
  - A) Both on floor of final focus tunnel
  - B) One on floor of pit, other on floor of N tunnel
- Large data set
  - Want  $\geq 100$  samples for good correlation statistics
  - Want  $\geq 8$  sec for good freq resolution
  - 128 samples, 8 sec each
- Test new passive anti-alias filters
- “Dry run” for CERN data collection

# Sensor Locations in Tunnels

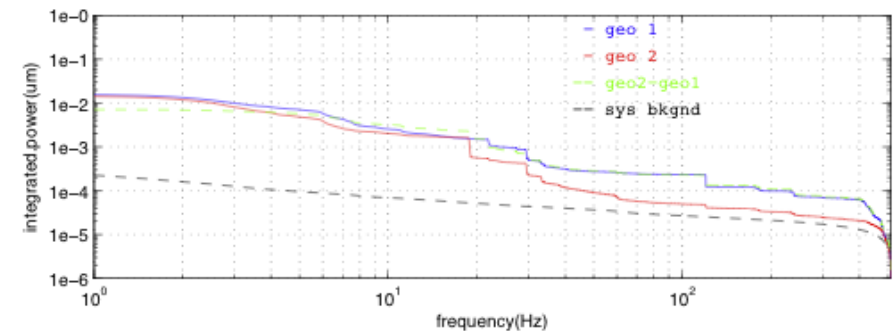
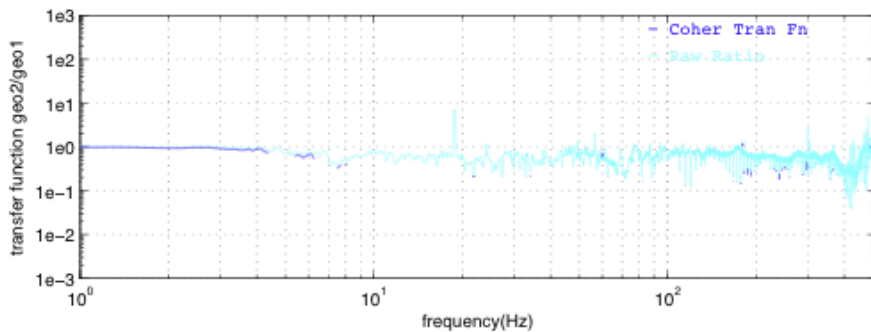
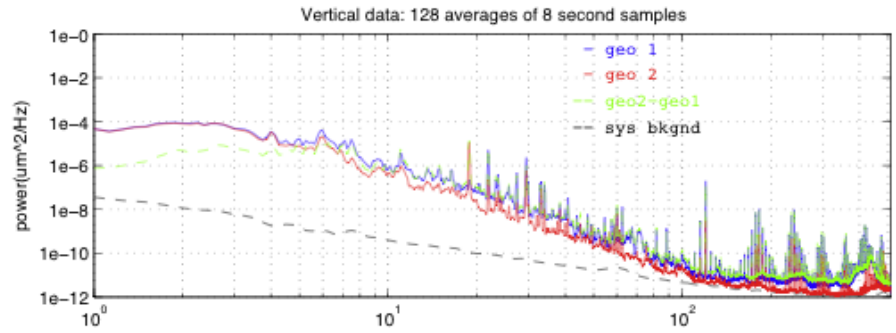
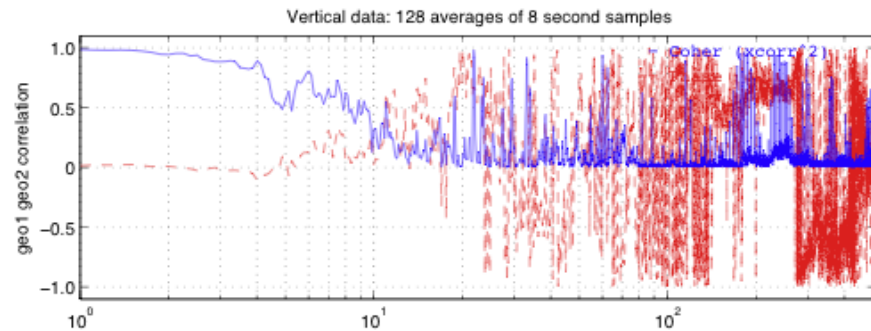


# Tunnel-Tunnel Correlation



- Good correlation to  $\sim 3.25$  Hz
- Geo1: N Tunnel; Geo2: S Tunnel

# Tunnel-Pit Correlation



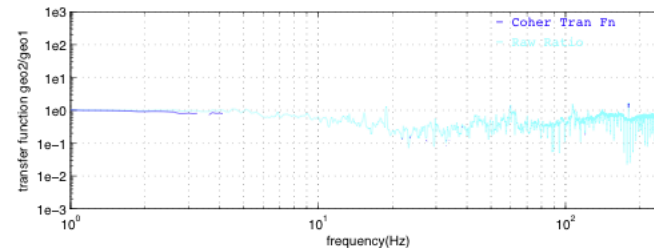
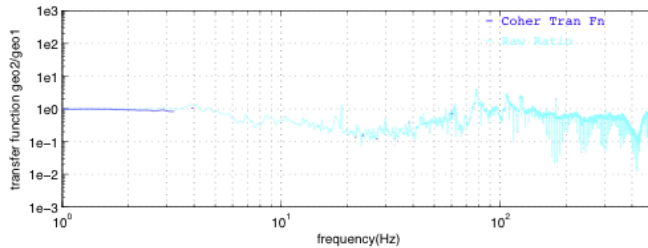
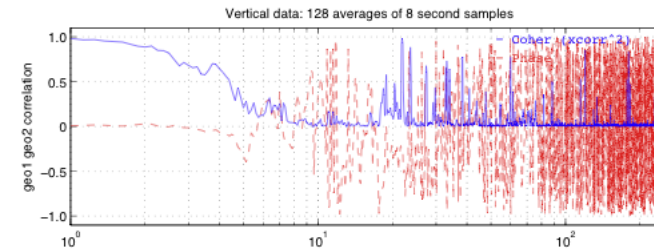
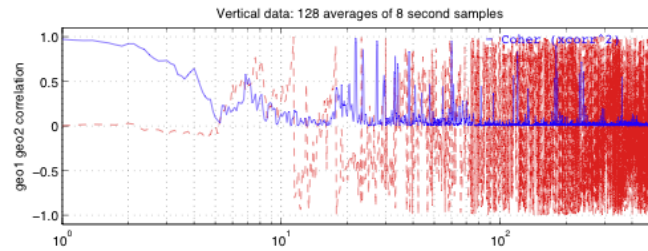
- Good correlation to  $\sim 4.25$  Hz
- Geo1: N Tunnel; Geo2: Pit Floor, Near Center

# Filter Tests

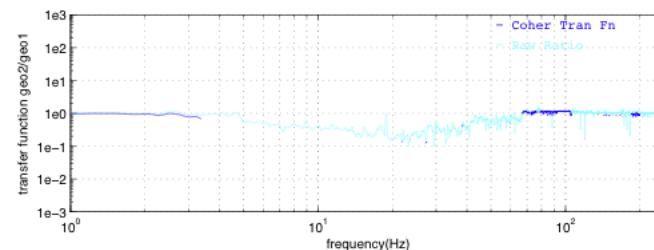
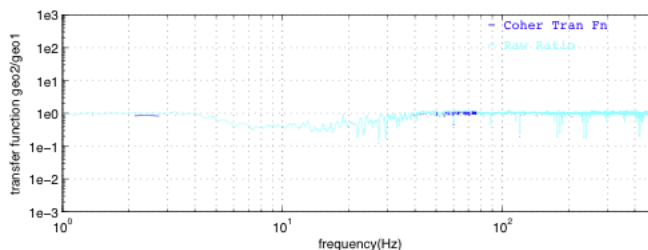
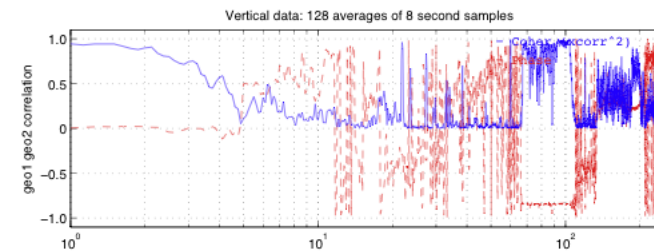
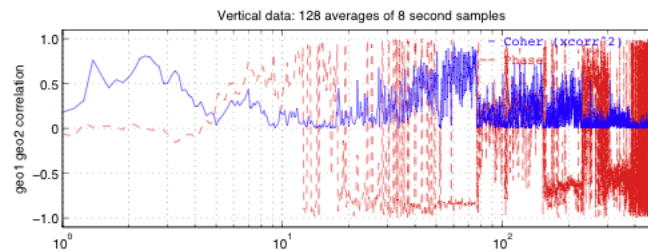
1024 Hz Sampling

512 Hz Sampling

No  
Filter



Filter



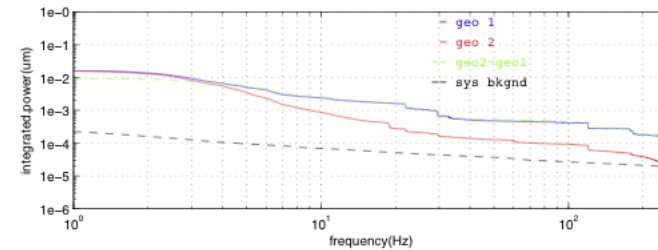
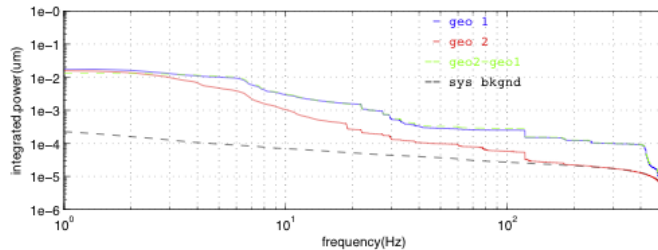
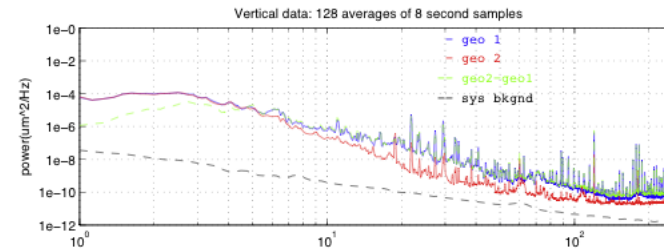
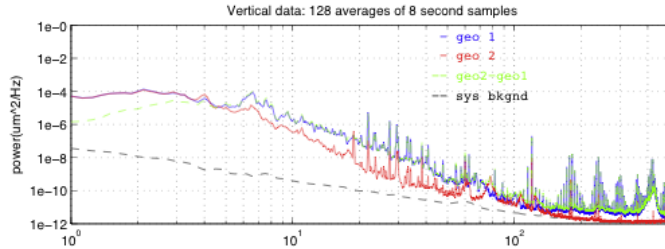
- Does filter have a bad effect on measurements??
  - Flaky correlation at LF? Correlated noise at HF?

# Filter Tests

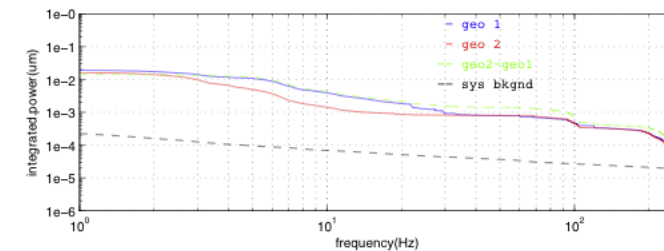
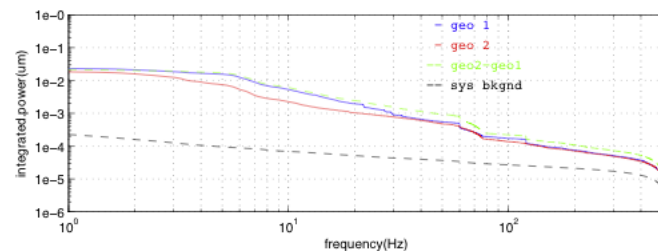
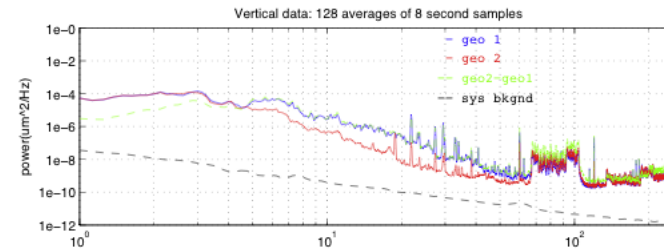
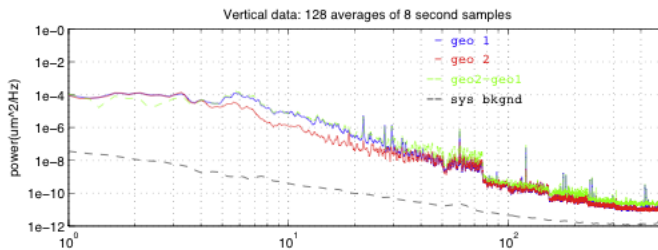
1024 Hz Sampling

512 Hz Sampling

No  
Filter



Filter



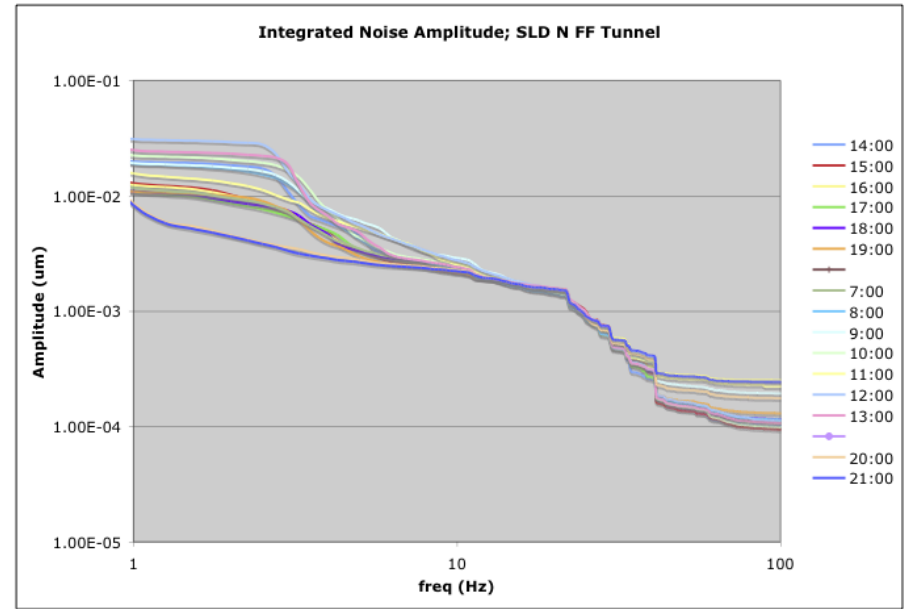
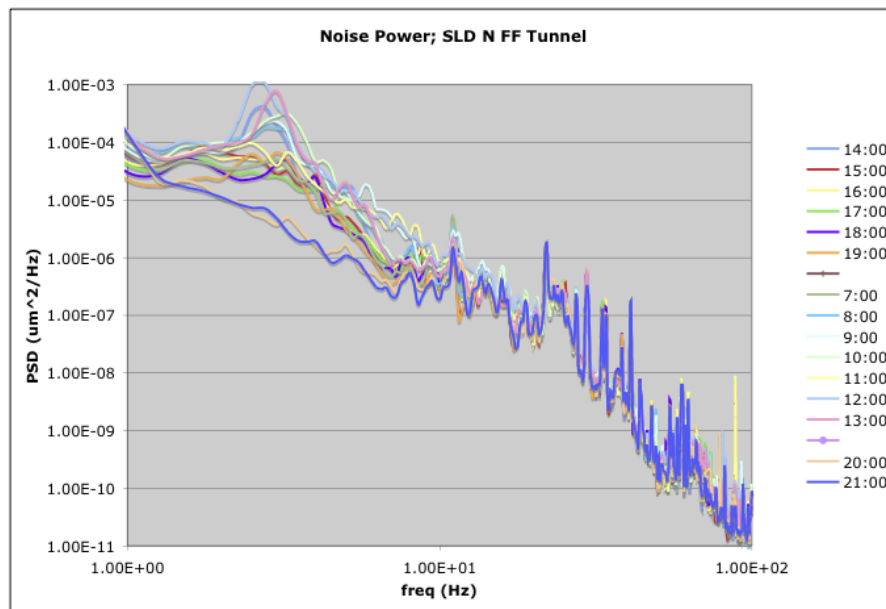
- Is filter even needed? No software crashes at 1024 Hz
  - 512 Hz with no filter has some aliasing (420 -> 92), but little overall effect



# Conclusions

- Good correlation measurements obtained with 128 samples, 8 sec each
- Sampling rate question:
  - 1024 Hz seems reliable. Previous software crashes on data rate probably due to other factors (laptop sleep? Incorrect buffer length?)
  - 512 Hz gives some aliasing, but has only minor effect at high freqs. Correlation measurements should be OK.
  - Passive anti-alias filter seems to have problems; don't use unless problems solved

# Vibrations vs Time of Day



- Vibration peak at  $\sim 3$  Hz around noon hour
- Vibrations low after  $\sim 8$  PM