Preliminary Results of the Ground Vibration Measurements at Potential Linear Collider Sites and Reference Places*

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Power Spectrum (Density)
A. Seryi SLAC-PUB-8893

Feedback Circuit of a Velocity Broadband Seismometer
E. Wielandt, University of Stuttgart, Seismic Sensors and their Calibration

* Done with the help of Ralph Wolfgang Assmann, William Coosemans and Stefano Redaelli from CERN; Volker Behrens; Hui Fricke from GSF; Thomas Jahr and Wernfrid Kühnel from University of Jena; Jerry Aarons, Clay Corvin, Fred Asiri, Keith Jobe, Frederic Le Pimpec, Marc Ross, Andrei Seryi and Javier Sevilla from SLAC; Thorsten Bierer and Jürgen Grabe from TUHH.
Overview

- **Introduction**
  - Why do we make seismic measurements?
  - Snowmass 2001 Working Group T6

- **Broadband seismometer**
  - CMG-3T Sensor from Güralp, UK
  - Detection of an earthquake

- **Theory**
  - Fourier Transformation
  - Integrated Motion Spectra
  - Coherence Spectra
  - Power Spectral Density

- **Reference Measurements**
  - Moxa: Seismic station near Jena
  - Asse: Research mine operated by GSF

- **Site Measurements**
  - Measurements at DESY and Ellerhoop
  - Measurements at CERN and LHC P4

- **Measurements at SLAC**
  - In Building 6 and Sector 10
  - At California Copper Mountain Site

- **Summary**

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**Feedback Circuit of a Broadband Seismometer**

**CMG-3T from Güralp, UK (open)**

- **South Sandwich Islands Region**
  - Measurements at HERA 17.12.2002, 6:36 h

**Broadband Seismometer and Detection of an Earth Quake.**
Seven Second Hum measured at SLAC Building 006.
Cultural Noise measured at DESY and SLAC Building 006.
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\[ \hat{x}_n \in \mathbb{R}, \ \forall n \in \mathbb{N}_N = \{0, \ldots, N - 1\} \]
\[ \tilde{x}_k = \frac{1}{N} \sum_{n=0}^{N-1} x_n e^{-i \frac{2\pi}{N} \frac{k}{n}} \]
\[ \sqrt{\langle a_n^2 \rangle_m} = \sqrt{\sum_{k=m}^{N-1} 2 \bar{a}_k a^*_k + \bar{a}^2_{N/2}} \]
\[ c(\omega_k) = \frac{\text{Re}(\tilde{x}_k \tilde{y}^*_k)}{\|\tilde{x}_k\| \|\tilde{y}_k\|} \]
\[ p(\omega_k) = \frac{\tilde{x}_k \tilde{y}^*_k}{\omega_k^2} N \Delta t \]

Discrete Fourier Transformation.
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Reference Measurements at the Research Mine Asse.
Cross Section of the Research Mine Asse.
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Measurements at DESY and CERN in 2002 and 2003.
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HERA WL745

Ellerhoop

CERN Workshop and Laboratory

LHC P4

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Measurements at SLAC in March 2003.
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