

# **1996 SCEC Annual Progress Report**

## **Portable Broadband Instrument Center**

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Project: Portable Broadband Instrument Center (PBIC)  
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Two new DASs were purchased along with three Guralp CMG-40T sensors. The PBIC expects to take delivery of the Guralps in early 1997. The PBIC was active in Web and software development, response calibration and outreach programs. Several publications involving data collected using PBIC equipment have been published or are in press.

### Equipment Usage

Yong-Gang Li completed a series of experiments to monitor trapped waves in fault zones. James Chin and Jamie Steidl concluded their study of amplification in the Los Angeles area. The CLC/SCEC UCSB Hazards Study project has begun using about half of the instruments to determine site response at UCSB. Other projects that expect to use the PBIC equipment are awaiting funding. When the instruments were returned from field experiments the PBIC took advantage of the time to perform thorough quality control testing. All of the equipment underwent extensive upgrades and maintenance.

Dates	Institution	PI(s)	Experiment
01/01/96-02/01/96	USC	Li	San Jacinto Guided Waves
01/01/96-01/15/96	UCSB/USC	Steidl/Chin	LA Microzonation
01/01/96-03/10/96	UCSB	Archuleta/Cochran	Santa Ynez Valley Ampl.
01/01/96-current	UCSB	Archuleta/Steidl	GVDA Rock site
05/15/96-05/30/96	USC	Robertson/Smith	LABNet Calibration
05/22/96	UCSB	Pizzi/Martin	Outreach presentation
08/01/96-10/15/96	USC	Robertson/Smith	LABNet Calibration
08/05/96-08/15/96	USC/USGS	Li	Landers Guided Waves
10/17/96-current	UCSB	Archuleta/Nicholson	CLC/SCEC UCSB Hazard Study
10/30/96	UCSB	Oglesby/Martin	Outreach presentation
11/26/96-current	USC	Robertson	LABNet Calibration

### SCEC Research Using PBIC Equipment

Michelle Robertson is using the calibration technique developed at the PBIC to calibrate the sensors in the USC LA Basin seismic Network (LABNet). The current project is an extension of the calibration program begun last year by the SCEC intern Ryan Smith. The previously collected information identified several problems and will provide a means of removing the instrument response from past data.

Yong-Gang Li continued his Landers research with a deployment of both PASSCAL and SCEC recorders near the Landers fault zone. The array was used to record both earthquakes and several explosions by the USGS.

Jamie Steidl is using a single station deployed at a rock site near the Garner Valley Downhole Array (GVDA) as a reference site for some comparisons of wave propagation in the valley. This site is used to evaluate the site response associated with rock sites that would be considered typical “reference” sites in site-specific hazard analysis studies. Steidl is also using the data to evaluate non-reference site techniques in estimating site response in a region where the true site response is known from extensive downhole instrumentation and geotechnical data.

PBIC equipment was used in several outreach demonstrations for local organizations. For two different elementary school presentations, the PBIC made short recordings of student’s stomps and was able to produce a personalized plot for each student as well as a large versatec plot of the entire demonstration for the classroom. These presentations were received enthusiastically. Undergraduates in the Geological Sciences Department at UCSB used PBIC equipment in other community demonstrations. The PBIC set up a DAS and computer system for the Santa Barbara Earth Day celebration. The PBIC completed the project to establish three CUBE stations on the UCSB campus. The three sites, at the Institute for Crustal Studies, the Davidson Library and in Geological Sciences, have been up and running for nearly a year now.

## **Sensor Calibration**

The sensor calibration procedures developed by the PBIC is now starting to be used more extensively in the seismological community. PBIC personnel have trained personnel from the Stanford PASSCAL PIC and USC in the use of the response hardware and software.

## **Hardware: Management, Development, Repair and Quality Control**

The NiCad batteries that maintain the DAS parameters were replaced after testing revealed their impending failure. Board level problems were diagnosed for four different systems and sent in to refttek for repair. The DASs internal timing systems were calibrated. GPS seals were replaced and the firmware upgraded. Fourteen equipment problem reports were filed and resolved this past year. Due to the higher performance and durability of the HP palmtops, no more money will be invested in repairing or purchasing Zeos Palmtops. The PBIC combined parts from two broken Zeos palmtops to create one working unit.

Four of the second generation of Calibration Response Boxes were produced this past year. Two of the units went to the Stanford PASSCAL group and two stayed with the PBIC.

The PBIC has continues to provide Refttek maintenance services to SCEC member institutions (UCLA, Caltech, USC, CSUN). Services include firmware upgrades, quality assurance testing, minor repairs and management of major repairs.

## **Software and computational support**

The PBIC web page was accessed 1800 times by 401 users in the last 12 months. The PBIC web page has been expanded and compartmentalized to provide more organized and thorough coverage of several topics. The equipment inventory page now has links to pictures of the different site components to assist newer equipment

users in identifying deployment needs. Timeline conversion into Web format has been somewhat automated. Expansion of the response pages is now a top priority.

Most of the continued development on the response software is the expansion of the GUI tools used to control the procedures. A first pass of experimentation looking at the non-linear behavior of tilted sensors has been completed. Trends in the observed data correspond to the expected model, but are off by a constant of proportionality. Peter Rodgers is currently investigating the mathematical model to see if this difference can be explained.

## **Publications**

Due to the wide distribution of the SCEC's earthquake data sets, such as Northridge and Landers, we will not attempt to list publications using those expansive data sets. Publications by the PBIC and researchers directly using the equipment will be listed.

- Abercrombie, R. E. (1996). The magnitude-frequency distribution of earthquakes recorded with deep seismometers at Cajon Pass, Southern California, *Tectonophysics*, **261**, 1-7.
- Bonilla, L.F., J. Steidl, G. Lindley, A. Tumarkin, R. Archuleta. Site Amplification in the San Fernando Valley, CA: Variability of site effect estimation using the S-wave, coda and H/V methods. *Bulletin of the Seismological Society of America*. (in press).
- Li, Y.-G., F. Vernon, K. Aki. San Jacinto Fault-Zone Guided Waves: For delineation of recently active fault strands near Anza, CA. *J Geophys. Res.* (in press).
- Li, Y.-G., W. Ellsworth, C. Thurber, P. Malin, K. Aki. "Fault-Zone Guided Waves from Explosions in the San Andreas Fault at Parkfield and Cienega Valley." *Bulletin of the Seismological Society of America*. (in press).
- Manov, D.V., R. Abercrombie, P. Leary (1996). Reliable and Economical High-Temperature Deep Borehole Seismic Recording, *Bull. Seism. Soc. Am.*, **86**, 204-211.
- Steidl, J. H., A. G. Tumarkin and R. J. Archuleta (1996). What is a reference site? *Bull. Seism. Soc. Am.*, **86**, 1733-1748.