1998 SCEC Annual Progress Report

Portable Broadband Instrument Center

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Project: Portable Broadband Instrument Center (PBIC)
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The PBIC saw a lot of activity in all facets of its program. Several large projects involving almost all of the PBICs equipment were deployed. The relatively new CMG-40T's have been used almost continuously in several field experiments. The telemetry system proposed last year will soon be deployed, and the outreach program of the PBIC has expanded to include information displays at several schools. The PBIC actively continues its web and software development, response calibration and field activities.

Equipment Usage

The northern Baja project, SDSU/UCSD, using the 3 CMG-40Ts since last year, finished up in late July, allowing those sensors to be mobilized in the first phase of deployment of the LARSE98 experiment.

Several projects this year involved shaking buildings. Early in the year, Javier Favella worked on recording the shaking of the Millikan building on Caltech's campus. The experiment, which used nearly all of the PBIC equipment, required extensive recordings over several weeks with a follow-up phase involving static recording. Near the end of November the Campus Laboratory Collaborative (CLC) project used several DASs and multiple sensors in a similar experiment on the UCSB campus. The project involved shaking the Engineering I building with a shaker borrowed from UCSD. The recording phase of this involved a few days for final equipment preparation and a single night to layout equipment and record. The web page http://www.crustal.ucsb.edu/clc/shake provides more details about the experiment.

The following table summarizes the projects that used PBIC equipment this year.

Dates	Institution	PI(s)	Experiment
01/01/98-current	UCSB	Steidl	Portable Borehole Study
02/15/98-07/18/98	Caltech	Favella/Heaton	Millikan Shake
06/10/98-current	CSUN	Simila	Santa Cruz
07/20/98-10/25/98	UCSB	Santillan/Steidl	Van Norman Dam Study
08/18/97-07/28/98	SDSU	Day/Astiz	Northern Baja Broadband depl.
10/03/98-current	UCLA	Kohler/Davis	LARSE98
11/23/98-11/24/98	UCSB	Archuleta/Steidl	CLC UCSB Shaking

Telemetry

The PBIC purchased one of the ARGOS satellite telemetry systems this past year. The system will allow the DAS user to get DAS status information sent to them several times a day via email. Extensive background work was required to get the system started. It involved a certain amount of paperwork as well as purchasing arrangements with two different agencies in addition to the manufacturer. The equipment was recently delivered and will be deployed soon pending the processing of some final paperwork by one of the service agencies.

Sensor Calibration

Several series of calibrations were run this year at the PBIC. Some of that effort was in calibrating sensors available to the PBIC, but not normally used. For example, the UCSB single component L4s used in the CLC shake experiment had not been used or calibrated in some time. Re-calibration of those components allowed the PBIC to evaluate the condition of the sensors as well as obtain the needed response information.

The LARSE98 project is preparing to do a field calibration of all sensors. This serves two purposes. The first is obvious: the calibration information for the sensors is recorded at a time when the sensors are being used. The second reason is that, as demonstrated by the LABPSE experiment, sensors left buried for any length of time will settle unevenly causing them to tilt. The calibration process will catch these tilts and allow the researcher to re-level those sensors that require it.

Hardware: Management, Development, Repair and Quality Control

The PBIC has upgraded the storage capacity of all disk subsystems for the DASs to a minimum of 1Gb. The increase in disk capacity allows users more data collection options but raises some other issues. The large amounts of data collected on these subsystems make it impractical to copy the data from disk to tape in the field. The PBIC is increasing the number of available disk subsystems to allow swapping of disks during service runs. The PBIC now has 24 field disks, plus an additional two drives that can act as transfer disks or field disks. The new field disks fabricated by the PBIC seem to be working quite well. We will soon fabricate more of those units to bring the number of field disks up to 30 or 31 including the two switchable units.

The equipment fared pretty well again this year with only 29 reported problems requiring attention. Most of those problems were resolved in the lab with only a few requiring more extensive repairs. Several of the recorders purchased in the third year had problems that were fixed by replacing bad backup batteries.

An inventory of PBIC equipment is shown in Table 1.

Computational Support: Web and Software Development

The PBIC web page access increased by about 70% this past year, being accessed 6923 times by 807 users in the last 12 months. The PBIC continues to expand the technical documentation and informational content of its web site.

Major software development this past year was minimal, but there was a lot of minor development for scripts used for processing data. There was further development done on the logfile association program in conjunction with the LABPSE project. Additional user interface development was undertaken on portions of the calibration/response software.

Outreach

The PBIC remained active in outreach programs, giving four presentations in association with ICS personnel in the past year. There are currently three pending requests for presentations that should be met by the end of February.

Another outreach program was started this year in conjunction with the SCEC borehole project. The project involves installing PC compatible 486 or pentium workstations running RedHat Linux in several schools that are scheduled for borehole seismometer installations as part of the SCEC borehole project. The workstations are set to boot automatically into an "outreach environment" that currently points to a web page maintained by the Institute for Crustal Studies (http://www.crustal.ucsb.edu/scec/outreach) specifically for the program. The "outreach environment" is set up in a relatively robust manner that will cause it to be reloaded if it's disturbed (ie: any of the required applications are terminated). Future plans are to incorporate data recorded at each particular borehole site into that sites outreach workstation and to expand the information presented beyond just web browsing capabilities.

Publications

The following publications reference data collected using the PBIC equipment.

Alex, C., L. Gurrola, E. Cochran, G. Ely, T. Tyler, C. Nicholson, and R.J. Archuleta, "Seismic hazards to the University of California Campus at Santa Barbara", *Seismol. Res. Lett.*, **v. 68,** p. 305 (1997).

Archuleta, R.J., C. Nicholson, J. Steidl, L. Gurrola, C. Alex, E. Cochran, G. Ely and T. Tyler, "Initial Source and Site Characterization Studies for the UC Santa Barbara Campus", *Report on the UC/CLC Campus Earthquake Program, LLNL Report UCRL-ID-129196,* 83 pp. (1997).

Kohler, M.D, D.J. Wald, and R.W. Graves, "The effect of localized sedimentary environment and subsurface structure variations on teleseismic waveform amplitudes in the Los Angeles basin", (poster presentation), fall AGU, 1998.

Rodgers, P.W., S.T. Swain, and J.H. Steidl (1998), "Self noise spectra and shake table tests of the Wilcoxon 731-4A and the Kinemetrics FBA23-DH accelerometers, Seis. Res. Lett. V 69, n 2, p164.

Steidl, J., C. Nicholson, R. Archuleta, P. Rodgers, S. Swain, A. Martin, L. Gurrola, C. Alex, G. Ely, E. Cochran, and T. Tyler, "Seismic hazard study of the University of California campus at Santa Barbara: Preliminary Results from the CLC Boreholes", Eos (Trans. AGU), **v. 78,** n. 46, p. F496-F497 (1997).

Steidl, J.H. (1998). "Site response for probabilistic seismic hazard analysis in Southern California", Seis. Res. Lett., v 69, n 2, p 149.

Wald, D.J., R.W. Graves, and M.D. Kohler, "Teleseismic waveform amplitude variations in the Los Angeles basin: an independent check of 2D and 3D earth structure models, (poster presentation), SCEC Annual Meeting, PalmSprings, 1998.

Table 1:

Equipment Inventory

The following table outlines the PBICs current major equipment inventory. Various subsystems, such as AC power and solar power, are not listed.

Qty.	Model	Description
9	72A-02	16 bit data acquisition system (DAS)
9	72A-08	16/24 bit data acquisition system (DAS)
24	72A-05/PBIC	External hard disk subsystems (200Mb-1Gb)
18	111A	GPS units
18	L4C3D	1Hz velocity transducer
16	FBA23	Force Balance Accelerometer
3	CMG40T	Intermediate period 3 component sensor
1		CMG40T interface/calibration unit
2	72A-03	Portable exabyte tape system
1		Portable DAT tape system
2		2-4 Gb Portable Data transfer disk
4		Zeos style palmtop computer
4		HP style palmtop computer