

LSC Six-Month Progress Report

Organization Stanford Advanced Gravitational Wave Interferometry Group

Report Date August 15, 2002

Attachment A - LIGO I Development Group
For the period February 2002 to August 2002

During the period of Feb 16, 2002 through Aug 15, 2002, Brian Lantz and other members of the Stanford Gravitational Wave Group collaborated with LIGO and various Attachment A LSC members to ameliorate the ground motion at the LIGO Livingston Observatory (LLO) by accelerating the development of the Advanced LIGO external hydraulic system so that it can be installed in initial LIGO if deemed appropriate. Pursuant to this agreement:

- a) Brian Lantz has served as the lead scientist for the hydraulic isolation system development at the LASTI facility at MIT and for deployment at the LLO.
- b) We held a PDR describing the hydraulic isolation system for use in initial LIGO. The design review was held on April 12, 2002. Slides are available in the LIGO DCC, G020169.
- c) We have continued the prototyping of the actuators at Stanford. We have completed the design of a new actuator which incorporated internal damping networks and integral bleed returns. We have identified and tested displacement sensors for use in LIGO 1 – the Kaman DIT 5200 differential eddy current displacement sensor. We have identified the Sercel, 1 Hz L-4C geophone as the inertial feedback sensor and the Streckeisen STS-2 long period seismometer as the ground motion sensor. The bellows will be made by Hyspan. The control valve will be a modified Parker hydraulics DYP-2S. We have designed and build new nozzles for the valves, and have built a test-stand for calibration of those nozzles. A manifold for the new valve has been built and installed on actuator version 2 and the new valve has successfully controlled the system in the Stanford facility.
- d) In collaboration with Ken Mailand at Caltech, we have completed the design for a new pump station to be deployed at the LASTI facility at MIT. We have also developed several modular components for filtering pressure fluctuations, which work well.
- e) We have finished the Matlab/ Simulink framework for a linear model of the mechanical, stack, and hydraulics of the LASTI installation. It has been distributed to members of the group for comment. We have also developed a non-linear model of the hydraulic actuator to study the cross-coupling of noise generated by one actuator causing unwanted motion in another.
- f) We are still working to complete the LASTI installation.