LSC Six-Month Progress Report

LIGO-M010059-00-M

Organization Australian Consortium for Interferometric Gravitational Astronomy (ACIGA)

Report Date February 15, 2001

Attachment A - LIGO I

Participation

Anthony Searle	100%
Susan Scott	100%
David McClelland	40%

LDAS Data Conditioning API Development

- Symmetric DFT storage (fvalarray) COMPLETED
- Mock Data Challenge COMPLETED
- Unified Data Type COMPLETED
- Action wrappers methodology and implementation IN PROGRESS
- Basic Functions IN PROGRESS

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Attachment B - Isolation/Suspension/Thermal Noise

Participation

Bram Slagmolen	100%
Malcolm Gray	50%
David McClelland	10%
David Blair	50%
Ju Li	50%
John Winterflood	100%
Clayton Locke	100%

Frequency distribution of thermal noise (FDTN) 1: front end

AU have:
- completed the installation of the vacuum system
- completed laser frequency stabilisation
- designed a new monolithic cavity for thermoelatic noise measurement.

FDTN 2: test cavity

ANU have:
- constructed first flexure and paramatrised change in resonant frequency and Q with etching
- designed cavity readout system
- commenced processing uhv system

FDTN 3: isolator and optical bench

UWA have:
- implemented improvements to the isolator by incorporating the new 'Euler spring' concept
- designed isolator to be constructed for thermal noise experiment.
- commenced design of suspended optical bench.

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Attachment C - Lasers/Optics

Participation

Jesper Munch	100%
Peter Veitch	75%
Murray Hamilton	100%
Damein Mudge	100%
Martin Ostermeyer	100%

Jesper Munch	100%
Peter Veitch	100%
Murry Hamilton	100%
Martin Ostermaeyer	100%
Chris Hollit	100%
Damien Mudge	100%
Fetah Benabid	100%
David Blair	50%
Ju LI	50%

Fabrication of HPL2 (520W pump power)

Fabrication of the laser head for HPL2 has been completed. Using an incorrectly cut slab gain media that exhibits thermal-stress induced birefringence, we have obtained a multimode power of 70W for 250W of pump power, with a slope efficiency of 32%. At higher pump powers, the birefringence increases intra-cavity losses and the output power saturates at 75W.

After 4 months of delay, new slab gain media that have been cut with the correct orientation in the boule and the correct orientation of the crystallographic axes have been recently delivered. We shall now confirm that the thermal-stress induced birefringence has been reduced, and then demonstrate lasing ia stable/unstable ring cavity.

Fabrication of the ARI laser

Tilt-locking of the 5W laser has been demonstrated. The results are to be published in IEEE JQE. We have also developed a new mount for the gain medium in NPROs. The new mount will allow the gain medium to be heated to 120C, and thus enable its emission wavelength to match the line-centre wavelength in high power lasers and amplifiers. There has been no progress in the fabrication of the ARI laser.

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Attachment D - Advanced Detector Configurations

Participation

Daniel Shaddock	100%
David McClelland	50%
Malcolm Gray	50%

Benchtop validation of a control scheme for RSE

This work has been completed with the successful demonstration of a control and signal extraction scheme which allows arbitrary tuning of the signal recycling mirror. Lock acquisition curves as well as frequency response data show the success of our phase modulation technique. The scheme is applicable to a long baseline interferometer though it may require significant modification of the modecleaner length before adoption by LIGO. A publication is in preparation.

Investigation of VRM configurations

- Funds to support this activity were secured.
- Work on an experimental investigation of various possibilities for a variable reflectivity signal recycling mirror was delayed due to personnel shortages.

An output modecleaner for AN RSE interferometer.

- Funds to support this activity were secured.
- Work on an experimental investigation of various possibilities for an output modecleaner was delayed due to personnel shortages.