LSC Six-Month Progress Report

Organization Australian Consortium for Interferometric Gravitational Astronomy (ACIGA)
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Attachment - C Lasers/Optics Development

Participation:

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Development of high power slave laser

The saturation of the output power at 70-80 W appears to be due to loss of mode control, which is caused by wavefront distortion within the gain medium, particularly the appearance of a negative lens in the horizontal direction. This distortion has been reduced considerably by decreasing the differences between the pump power emitted by the optical fibres coupled to the diode lasers, by replacing burnt fibres and improving the alignment of the fibres to the diode lasers. Nevertheless, the distortion is still too large.

We have therefore redesigned the gain medium to improve the homogeneity of the pump distribution, replace the Teflon coating of the cooled faces with SiO_2, replace the water cooling by conduction cooling and reduce the birefringence expected to occur at very high pump powers. The material for the new gain media has been delivered and the slabs are currently being polished and coated. Redesign of the laser head has commenced.

Development of a 10W slave laser

A field-deployable base for the 10W laser has been developed and fully tested. Standing wave lasing produced 15W of multi-mode power at about 40W pump. Assembly and optimization of a traveling-wave laser has commenced. Preliminary injection-locking of the traveling-wave laser has been demonstrated.

Refurbishment and redevelopment of NPRO

The temperature at the centre of the gain medium in a high power Nd:YAG laser is expected to be 50-100 C. Since the gain medium in commercial NPROs can only be heated to 60C, this may cause problems for injection-locked lasers and MOPAs as the wavelength of line centre in the high power laser could be significantly different to that of the NPRO. We have modified an NPRO to allow its gain medium to be heated to 100-120 C. The modified NPRO has been reassembled and produced 150 mW at a gain medium temperature of 110 C.