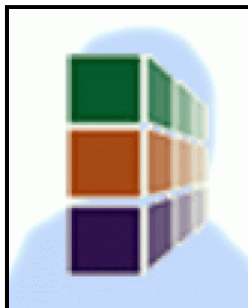




Events

[Current Events](#)[Lectures ▾](#)[Events Archive ▾](#)

Special Guest Lectures

Beams of the Future**Mihai Bondarescu, Caltech**Nicholson Hall 262
April 10, 2008 - 09:30 am**Abstract:**

Thermal noise is the dominant source of noise in the most sensitive frequency band of second generation ground based gravitational wave detectors. Reducing it as much as possible is of paramount importance for increasing detector sensitivity and observing not only gravitational waves, but also quantum phenomena such as entanglement of 40 kg objects. Reshaping the beam to wider profile which probes more of the mirror surface reduces this noise. The "Mesa" beam shape has been proposed for this purpose and for a long time it has been regarded as the leading low-noise beam for LIGO. We have shown that thermal noise can be reduced by 12% with no additional effort by using finite mirror effects to our advantage rather than working against them. A reduction of 28% can be obtained by reshaping the mirror to coincide with the phase front of the real beam instead of a theoretical beam modeled with infinite mirrors. A drastic reduction in thermal noise by as much as 60% can be obtained by employing a numerical minimization algorithm. The resulting beam is related to the nearly diffraction-free Bessel-Gauss beams and is supported by nearly conical mirrors. An overall noise reduction by a factor of two would increase the event rate by a factor of three.

