LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
--LIGO—
California Institute of Technology
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Scattering Study of 80mm x 120mm LIGO Test Mass

This is an internal working note of the LIGO Laboratory.

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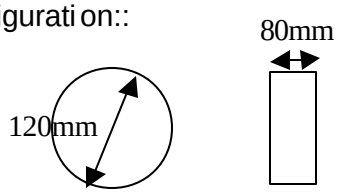
Below we present preliminary results from imaging scattering in two sapphire samples: the “UWA sample”: a CS sample 60mm x 150mm and the LIGO sample 80mm x 120mm.

The sapphire was illuminated by a normal incidence HeNe laser 10mW and was imaged by a Sony digital camera. Our high sensitivity Meade camera malfunctioned so calibrated scattering intensity data is not available.

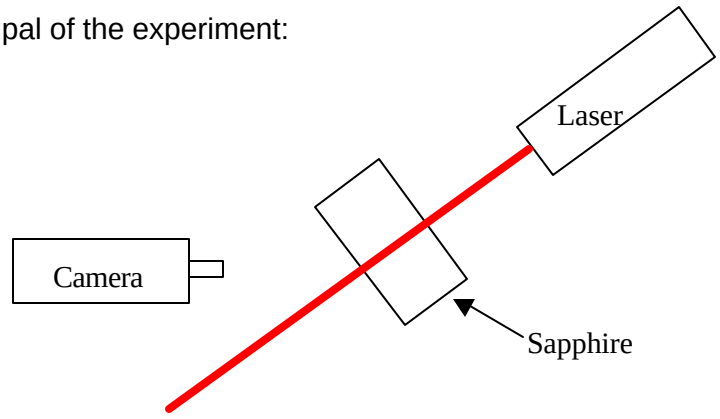
Results show that there is one *bright* point defect every 20 cubic millimetres. *Small point defects* occur about one per 7 cubic millimetres. A continuous background of scattering is also visible Preliminary estimates put the scattering level at `100 times that of “normal” sapphire material, ~1000ppm/cm.

Experimental Configurati on::



Laser beam diameter: 1.5mm

Principal of the experiment:



Six randomly located photos of the LIGO test mass are shown below, followed by a single photo of the UWA sample which shows no detectable signal. All photos show strong surface scattering at the entry and exit points, plus a line of scattering defects.:

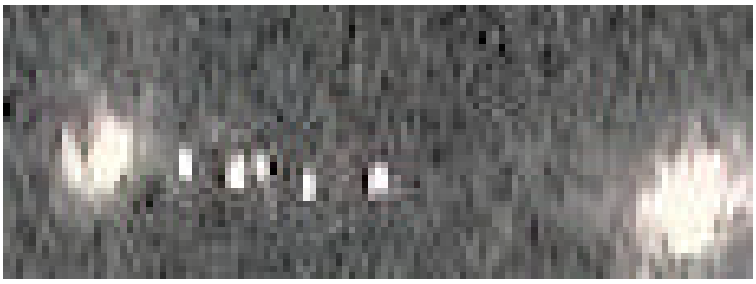


Image1, LIGO test mass (UWA, 08/08/02)

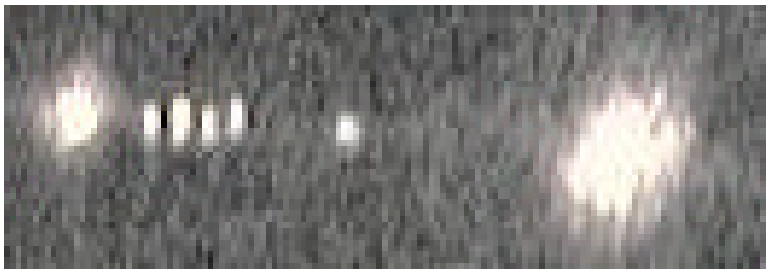


Image2, LIGO test mass (UWA, 08/08/02)

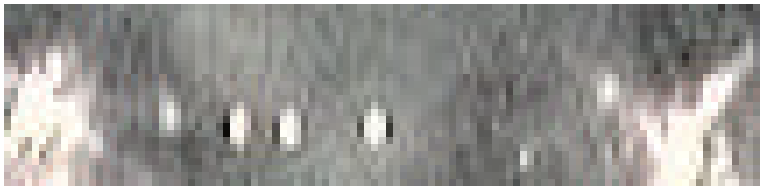


Image3, LIGO test mass (UWA, 08/08/02)

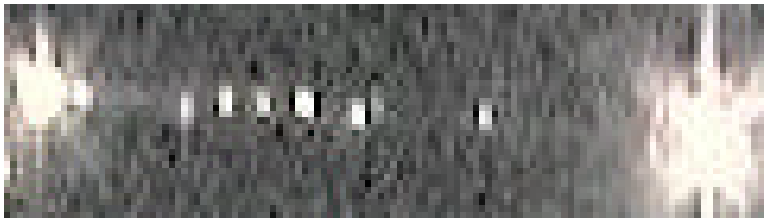


Image4, LIGO test mass (UWA, 08/08/02)

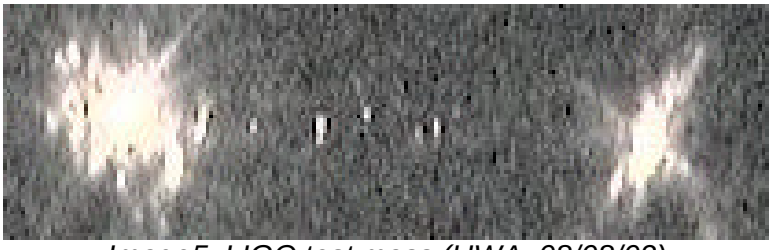


Image5, LIGO test mass (UWA, 08/08/02)

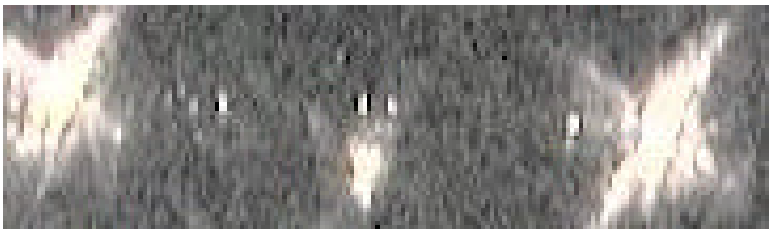


Image6, LIGO test mass (UWA, 08/08/02)

Photo of the AIGO test mass: