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► To cite this version:

K.-I. Ueda, N. Uehara. New approach of laser diode pumping of solid state lasers for gravitational wave measurements. Journal de Physique IV Proceedings, 1994, 04 (C4), pp.C4-593-C4-593. 10.1051/jp4:19944144 . jpa-00252599

HAL Id: jpa-00252599

<https://hal.science/jpa-00252599>

Submitted on 1 Jan 1994

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New approach of laser diode pumping of solid state lasers for gravitational wave measurements

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A new scalable side pumping geometry of solid state lasers by means of multi laser-diodes (LDs) has been developed related to the gravitational wave detection. Multi-LD beams concentrated onto the optical axis of a laser rod forms a virtual point or line source for rod pumping. A cylindrical cavity for LD pumping allows the multi-pass excitation of coaxially arranged rod in a form of image relay configuration. In this geometry the image deformation of virtual point source is minimized so that efficient multi-pass excitation is possible. Multi-pass excitation allows the effective pumping of optically thin materials in a manner of center-core pumping. The geometrical factor of conversing beam excitation is effective to concentrate the pumping power at the center of rod. Theoretical and experimental analyses have been investigated by using thirty-two channels of fiber-coupled LDs. High efficiency single mode performance has been demonstrated successfully. The high power version of this geometry under development will be discussed related to the future plan of gravitational wave detection.