

Experimental Study of Face- and Edge-Pumped Ceramic Slab DPSSLs in the 100-500 W Power Range

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We developed several prototypes of ceramic Nd:YAG slab lasers pumped by different laser diode stacks. Compactness, efficiency and ruggedness have been the principal design drivers. Nevertheless beam quality and insensitivity to diodes temperature have also been pursued. An edge-pumped device with less than 12% power variation over a 20°C temperature range has been demonstrated.

In the past few years we have developed and investigated several ceramic Nd:YAG slab lasers with different pump and resonator schemes [1]-[3]. All the devices are based on a Brewster-angle zig-zag slab concept. The slabs have been supplied by Baikowski Japan (Narashino-Shi, Japan). Typical extraction results of some sample devices are reported in Tab.1. We tested hybrid stable-unstable resonators obtaining beams with BPP below 3 mm.mrad [2].

Tab 1. Slab performance summary.

Pumping	Regime- Duty	Doping	Diode stacks	Power (ave. – Peak)	Efficiency (o-o/slope)
Face	QCW-600Hz-15%	1%	IMC (Horiz.)	42W - 349W	29% - 41%
Face	CW	1%	Nuvonyx (Vert.)	110W - N.A.	21% - 26%
Edge	QCW-10-HZ-0.2%	0.6%	Lasertel (Vert.)	1W - 398W	16% - 24%

Insensitivity to diodes temperature has been pursued using a long pump-absorption depth in an edge pumped folded resonator device. The extraction curves obtained with this device are reported in Fig.1, for three different diode temperature operations, showing the reduced variation over the 20°C interval.

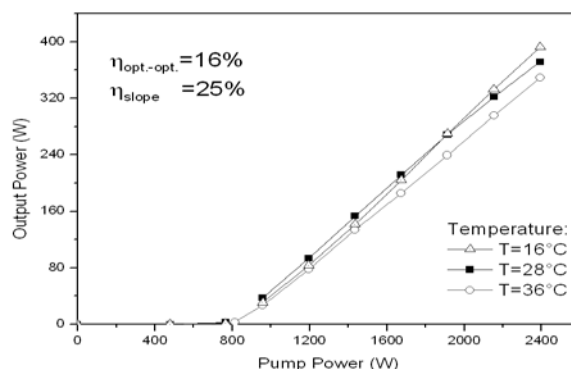


Fig. 1. Extraction characteristics of the edge-pumped slab DPSSL at different operation temperatures.

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- [2] M. Ciofini, E. Favilla, A. Lapucci, E. Sani, “Propagation Parameters of the beam extracted from a diode pumped Nd:YAG ceramic slab laser with a hybrid stable-unstable resonator”, *Journal of Optics and Laser Technology* **39**(7), 1380-1388 (2007)
- [3] A. Lapucci, M. Ciofini, E. Favilla, E. Sani, M. De Rosa, G. Mincuzzi, A. S. D. Rocco “Quantitative analysis of the thermal distortions in a 100 W CW Nd:YAG ceramic slab laser”, *Journal of the European Optical Society - Rapid Publications* **2**, 07020 (2007)

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