MULTIROD ND:YAG RESONATOR WITH POLARIZATION-DEPENDENT BIFOCAL LENS

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Many laser applications require high power and good beam quality, however, the development of lasers with high power and high beam quality is still an open problem especially due to thermal effects that in turn can cause distortions of the spatial beam mode. One of the most harmful effects is known as thermal lensing, if the effective dioptric power of this lens becomes strong the optical resonator may become unstable. Furthermore, increasing the pump intensity in the active medium also aggravates the aspheric components of the thermally induced distortions. By using several rods inside the same resonator and by a suitable choice of rod position and resonator parameters, the output power range can be increased proportional to the number of rods without reducing the beam quality. However, thermal focusing and birefringence of the pumped rod have a significant influence in the operation of side pumped Nd:YAG lasers, especially in the case of single transverse mode operation. The instabilities of the lens and the requirements for alignment of a multirod resonator were examined theoretically and experimentally with a Fabry-Perot resonator with two and three rods. The polarization-dependent focal length is also studied in this work. Output powers up to 205 watt at good beam quality have been achieved for three rods and 180 watt for two rods both in CW regime.