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A Coherent White Paper

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### Advantages of Optically Pumped Semiconductor Lasers - Invariant Beam Properties

The optically pumped semiconductor laser (OPSL) is a unique patented technology that combines the most desirable attributes of laser diodes, DPSS (Diode Pumped Solid State) and Ion lasers, while eliminating a number of their compromising limitations. One of their key advantages is the freedom to adjust the output power over a large range (10-100%) with no effect on, important output beam parameters, including beam divergence, beam shape and beam pointing.

#### The Advantages of Independent Power Adjustment

The ability to vary laser output power or to operate a laser at less than its maximum power is often an important capability. In many instances, using the "power knob" is essential to optimize processes or experiments like preventing detector saturation or sample damage. It is also often preferable to perform system alignment and testing with reduced power - to minimize the risk of damage and to maximize eye safety. Also superresolution microscopy techniques like STED require fine power adjustment to optimize nanometer scale resolution. Thus, the option to smoothly reduce output power is more desirable than resorting to some type of attenuator, both for ease of use and set-up simplicity.

Unfortunately, in most other solid state lasers, reducing power from the manufacturer's specified optimum value also compromises beam properties: in particular, beam divergence, and also beam diameter, mode quality and beam pointing. The reason is a phenomenon called thermal lensing that is common to solid state lasers based on bulk materials such as Nd:YAG.

#### The Problem of Thermal Lensing

When a laser gain crystal or glass is optically pumped, some of the pump power is unavoidably converted to heat. In addition, self-absorption of the laser beam heats the active volume of the crystal. In order to stabilize performance and avoid damage, the gain crystal is cooled in

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## Advantages of Optically Pumped Semiconductor Lasers – Invariant Beam Properties

The optically pumped semiconductor laser (OPSL) is a unique patented technology that combines the most desirable attributes of laser diodes, DPSS (Diode Pumped Solid State) and Ion lasers, while eliminating a number of their compromising limitations. This whitepaper describes one of the key advantages of OPSLs: the ability to adjust the output power over a large range (10-100%) with no effect on the other important output beam parameters, including beam divergence, beam shape, and beam pointing.

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