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A Coherent White Paper

Diode Lasers Enable Diverse Therapeutic Applications

Lasers are widely used throughout medicine, from diagnostic imaging and clinical testing to surgical treatments and the latest aesthetic procedures. For therapeutic medical procedures, in particular, diode lasers have now become the dominant laser type in use. This is because these workhorse devices provide lower cost of ownership, a wider choice of output wavelength and power, compact, rugged packaging, and superior (semiconductor) reliability as compared to other laser types. In this article, we briefly examine the main features and advantages of typical diode laser types and then survey some of the leading therapeutic applications that currently rely on them.

Diode Laser Advantages

The diode laser is a monolithic semiconductor device that directly converts electrical energy into laser light. By using different semiconductor compositions, the output wavelength can be set to be in the blue, green, red, or near and mid infrared, with near-infrared devices generally offering the highest power levels. This wide choice of output wavelengths enables the laser system to be tailored to best match the needs of each specific application, e.g., to maximize blood coagulation, to tighten collagen, to maximize tissue ablation, to maximize penetration depth in soft tissue or to limit it to surface treatment, to bursts target cell, to kill dental pathogens, and so on. For every application, there is one or more optimum wavelength bands which delivers the best selectivity, i.e., where the laser produces a maximum effect while minimizing any unwanted collateral effects.

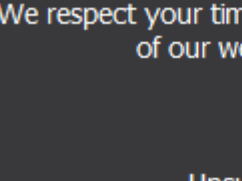

Figure 1: Power scaling in diode lasers. A water-cooled diode laser bar typically contains a section of wafer with up to 40 emitting facets. Integrating multiple bars into a two-dimensional stack provides a simple modular route to even higher power.

Diode Lasers Enable Diverse Therapeutic Applications

Diode lasers have become the dominant laser type used in therapeutic applications. This is because these workhorse devices provide lower cost of ownership, a wider choice of output wavelength and power, compact, rugged packaging, and superior (semiconductor) reliability as compared to other laser types. In this white paper, we briefly examine the main features and advantages of typical diode laser types and then survey some of the leading therapeutic applications that currently rely on them.

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