HeNe gas lasers vs. laser diode modules

Although HeNe gas lasers offer exceptional reliability and optical quality, users are quickly replacing them in their OEM applications with semiconductor laser diode technology. Laser diode modules offer many physical and electronic advantages over HeNe lasers.

HeNe laser advantages

HeNe gas lasers provide superior optical characteristics. While laser diodes must take advantage of external optics to yield a high quality output beam, HeNe output is well-collimated and does not require external optics. HeNe lasers also offer excellent coherence lengths (10cm to several meters), and most small tubes operate as single mode (TEM_{00}).

Semiconductor laser diode advantages

Laser diode modules are smaller, more efficient, and more versatile than HeNe lasers. For example, one of our more popular laser diode modules, the PPM, measures approximately 1.5 inches in diameter and 5.7 inches in length, while our smaller RC unit measures only 0.5 inch in diameter and 1.3 inches in length. Also, laser diode modules typically require less than 0.5W of energy, whereas an average HeNe laser requires 10 to 20W of energy to produce a few milliWatts of light. In addition, laser diodes provide an abundance of available wavelengths in the ultraviolet, visible, and infrared, while HeNe lasers limit users to half a dozen or so wavelengths.

Because of their compact size and low power requirements, laser diode modules have found their way into such OEM products as CD players and high-resolution printers. If a HeNe laser were incorporated into these applications, the products would likely be five to ten times their current size. Laser diode modules have also served users well in such demanding applications as Raman spectroscopy, fluorescence, confocal microscopy, holography, LIDAR, and flow cytometry. In fact, laser diode modules can do virtually everything a HeNe can do, at a much lower cost, in a smaller package, and in a far more efficient manner.

Laser diode optical correction

By incorporating one of a variety of beam correction methods to our laser diode modules, users not only can benefit from the natural advantages of laser diode technology, but they can have a circularized, astigmatism-free beam, as well. We offer several methods of improving the beam quality of a laser diode and making it emit more like a HeNe laser.

- We can integrate a highly advanced microlens into a variety of our packages. Microlensing circularizes the naturally elliptical light output of a laser diode. The microlensed diode emits a circular, diffraction-limited beam without the inclusion of correcting prisms and lenses. In addition, the extremely high entrance NA (numerical aperture) of the microlens captures virtually all of the optical energy available from the laser diode.
- Another method of beam circularization employs a pair of anamorphic correcting prisms. By adjusting the angles of the prisms and incorporating a circular aperture, we can circularize an elliptical beam. For astigmatic correction, we use a weak cylindrical lens after the collimating lens. Employing both of these methods results in a cost-effective means of correcting a beam.
- A method of both circularizing an elliptical beam and correcting astigmatism involves coupling a laser beam into a fiber optic. This method yields a superior, circular beam with low light scattering and no residual astigmatism.

We at Power Technology, Inc. are one of the few HeNe power supply manufacturers capable of providing you with laser diode modules to update your existing HeNe applications. If laser diode products are of interest to you, please feel free to give one of our sales engineers a call to discuss your application.

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