



Amoco Laser Company

*AMOCO
MICROLASERS . . .*

SPANNING

THE

SPECTRUM





*MICROLASERS,
A REVOLUTION IN THE MAKING*

Microlaser technology is creating a revolution in today's laser industry by changing the basic concepts of laser materials and design as well as manufacturing methods. The transition from traditional "glass-tube" laser technology to the all-solid-state technology of microlaser products is analogous to the transition from vacuum tubes to transistors that revolutionized the electronics industry and opened vast, new markets. In a similar fashion, microlaser technology promises to create large, new markets for lasers by providing high-performance laser-light sources at inexpensive prices. Amoco Laser Company is dedicated to being the leader in this "Microlaser Age" of photonics.

MICROLASER TECHNOLOGY

Amoco microlasers embody the newest advances in laser technology. Featuring all-solid-state construction, microlasers use a semiconductor diode laser to optically pump a solid-state laser crystal. Solid-state crystals with nonlinear optical properties can be added intracavity to achieve a wide spectrum of output frequencies. The result is a rugged, compact "microlaser" which produces a gaussian, diffraction limited, TEM₀₀ beam with a choice of wavelengths ranging from the infrared to the visible spectrum.

By using high-efficiency diode lasers as pump sources and temperature tuning their output to match the absorption bands in the solid-state gain material, microlasers attain electrical-to-optical efficiencies several orders of magnitude better than gas-discharge or flashlamp-pumped lasers. In addition, the solid-state cavity produces a high-quality beam in contrast to the typical double-lobed output of a diode laser.

AMOCO LASER COMPANY

Amoco Laser Company was formed in 1986 to commercialize the revolutionary "microlaser" technology developed at the Amoco Research Center. Amoco Laser is dedicated to the goal of providing inexpensive, high-performance laser products for the entire spectrum of laser applications. To achieve this goal, Amoco Laser has formed strategic alliances with several leading companies in the areas of high-volume, low-cost manufacturing, solid-state materials, and high-power laser diodes.

At its facilities in Naperville, Illinois, Amoco Laser Company conducts microlaser research, engineering development, and production. Additional, fundamental research is performed at Amoco Research Center in the East-West Research Corridor outside of Chicago.

FEATURES

ALL SOLID STATE

Microlasers feature rugged solid-state crystals and semiconductor materials. No fragile or inefficient flashlamps or gas discharge tubes are used.

HIGH EFFICIENCY

Electrical-to-optical efficiencies approaching 10% are possible with microlasers compared to 0.02% for a typical gas-discharge laser.

LONG LIFETIMES

The pump sources in microlasers are laser diodes with lifetimes ranging from 20,000 to 40,000 hours.

LOW NOISE

Microlasers can achieve RMS noise of less than 0.2%.

EXTREMELY STABLE

Power stability is several times better than comparable gas-discharge lasers.

GAUSSIAN BEAM

All microlasers have a diffraction limited, TEM₀₀ beam profile.

LOW VOLTAGES

Less than 5 volts is used to power the laser head compared with greater than 1,000 volts for many gas-discharge lasers.

RUGGED CONSTRUCTION

Replacing fragile glass tubes with all-solid-state components that are integrated into a monolithic structure makes microlasers extremely rugged and durable.

HIGH RELIABILITY

Solid-state technology combined with a unique engineering design makes microlasers extremely reliable.

SMALL SIZE

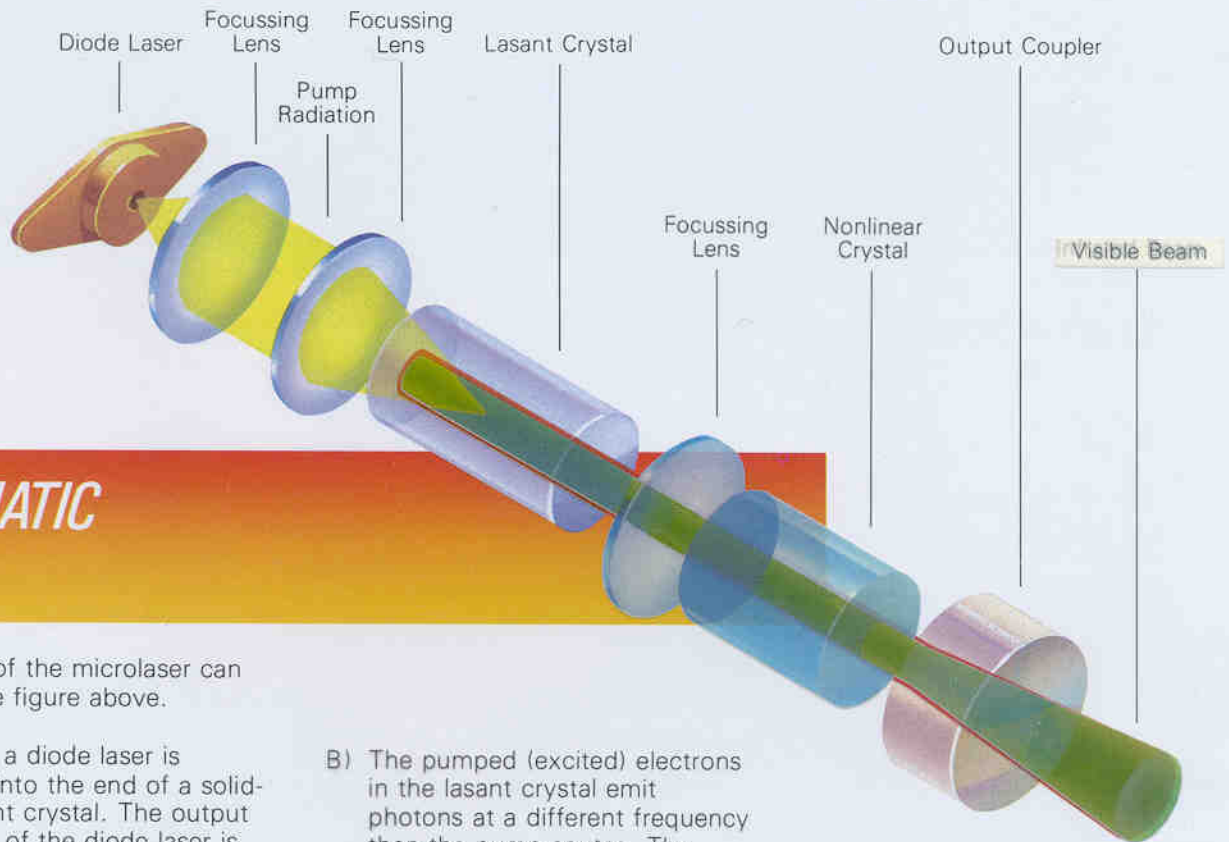
Using semiconductor diode lasers with small solid-state crystals allows production of highly efficient, compact microlaser products.

VERSATILITY

Microlaser technology provides products with outputs spanning a wide range of wavelengths and powers.

APPLICATIONS

- Alignment
- Entertainment
- Fiber Optics
- Forensic
- Holography
- Injection Seeding
- Materials Characterization
- Medical
- Metrology
- Micromachining and Microsurgery
- Military
- Optical Storage
- Optical Testing and Inspection
- Reprographics
- Research
- Others



SCHEMATIC

A schematic of the microlaser can be seen in the figure above.

- A) Output of a diode laser is focussed into the end of a solid-state lasant crystal. The output frequency of the diode laser is temperature tuned to optimize its absorption in the crystal. This is the most efficient means of optically pumping a laser gain medium.
- B) The pumped (excited) electrons in the lasant crystal emit photons at a different frequency than the pump source. The emitted frequency is typically in the infrared. These infrared photons are reflected back into the gain medium by mirrors where they can stimulate emission of other, coherent photons. Repeated stimulated emission raises the photon density inside the laser cavity to a high level from which a portion of the photons is allowed to exit through the end mirror in the form of an infrared laser beam.
- C) A focussing lens and a nonlinear optical crystal can be added inside the laser cavity to double the frequency of the infrared radiation into the visible range. For example, a microlaser that normally produces infrared laser radiation at 1064 nm can be frequency-doubled with the addition of a nonlinear crystal to a wavelength of 532 nm — green light. Various lasant crystals can then be used with different nonlinear crystals to produce a family of laser products with outputs spanning the visible and infrared spectrum.

OUR COMMITMENT

AGGRESSIVE RESEARCH

Amoco Laser Company vigorously researches all aspects of microlaser technology. New, high performance solid-state materials are continually analyzed and evaluated for microlaser production. Diode lasers are being developed for maximum performance. Optics and coatings are investigated and improved to achieve high optical efficiency. Laser pumping schemes and cavity geometries are carefully optimized to ensure the best possible product. Large scale, fundamental research in semiconductors and photonics is also conducted at Amoco Research Center to support the expanding development of microlaser technology.

METICULOUS ENGINEERING

Attention to detail in the selection of materials, mounting of optics, and integrity of mechanical parts yields a highly reliable, extremely rugged microlaser. A clean, functional design engineered with watchmaker precision guarantees long service life and trouble-free operation. Continuous post-design analysis is performed to further im-

prove the product. Semiconductors, crystals, optics, and mechanical assemblies are integrated in an Amoco microlaser to form a whole which is much more than the sum of the parts.

INNOVATIVE PRODUCTION

Amoco is breaking new ground in laser fabrication by applying high-volume manufacturing techniques to produce microlasers. Standardized parts and assembly for an entire family of microlaser products allows a uniform manufacturing technology that reduces product costs. This uniform technology allows physically indistinguishable solid-state materials with different lasing properties to be efficiently assembled into microlaser products operating at a variety of different wavelengths. Many different products from one technology means lower manufacturing costs.

INTERNATIONAL MARKETING

Amoco Laser Company has set up a worldwide network of distributors to meet the needs of the laser community. Amoco is committed to working with its customers to develop unique solutions for individual applications. "Market guided—technology driven" is the Amoco approach to the laser business.

OUR CHALLENGE

QUALITY PRODUCTS

Products that leave Amoco Laser Company must meet the highest standards of construction and performance.

PRODUCTS TO FIT THE MARKET

Amoco Laser Company continually strives to build products that meet the particular needs of the laser marketplace.

NEW PRODUCTS TO OPEN NEW MARKETS

Constant growth in the microlaser family of products will address new applications that are not possible with conventional technology.

DEPENDABLE, RESPONSIVE SERVICE

Amoco Laser Company is dedicated to prompt and reliable customer service.

BE THE BEST

At Amoco, being good is not good enough. We have to be the best, and you should expect nothing less.



Amoco Laser Company
1251 Frontenac Road
Naperville, Illinois 60540

