Global markets for laser systems, components, and materials

The global market for laser systems, components, and materials films was valued at $21.0 billion in 2024 and is expected to grow at a compound annual growth rate (CAGR) of 7.7% to reach $30.4 billion by the end of 2029.

The growth of industrial automation and smart manufacturing technologies is driving the adoption of laser technologies, which offer high precision, reduced wastage of materials, and enhanced efficiency of industrial processes. The rapid growth in electronics is spurring the laser technology market along as well, as lasers are required for annealing, dicing, and micro-drilling semiconductor wafers.

The global laser systems market is segmented into four types:

- **Solid-state lasers** use a solid material as their gain medium, such as a crystal or glass infused with rare earth elements. Among different types, fiber lasers are the most popular due to their high efficiency, excellent beam quality, and versatility for industrial and scientific applications. One recent innovation is the development of advanced ultrashort pulse solid-state lasers, which are increasingly used in applications such as glass and organic light-emitting diode display manufacturing.
- **Semiconductor lasers**, also called diode lasers, generate light by electrically exciting semiconductor materials. These lasers offer the advantages of fast modulation, high efficiency, and compact form, which make them suitable for large-scale deployments in various industry verticals.
- **Gas lasers** use a gaseous substance as the gain medium. CO_2 lasers are mainly used in materials processing because they can cut and engrave nonmetallic materials. Excimer lasers are popular in semiconductor lithography and ophthalmic procedures, while helium–neon lasers are usually used in laboratory applications.
- **Liquid lasers** use dye solutions as the gain medium. As they can generate tunable wavelengths, these lasers are used in several niche applications, such as isotope separation. Future developments are expected to be focused on reducing the toxic environmental impact of the dyes used in these systems.

Table 1. Global market for laser systems, components, and materials, by end use, through 2029 ($ millions)

End use	2024	2025	2029	CAGR % (2024–2029)
Industrial	6,393.4	6,546.1	8,471.2	5.8
Semiconductor and electronics	4,145.1	4,471.7	6,990.6	11.0
Medical and aesthetics	3,124.2	3,324.0	4,899.2	9.4
Telecommunications	2,457.2	2,593.2	3,684.2	8.4
Defense and surveillance	1,708.1	1,775.5	2,303.9	6.2
Instrumentation and scientific research	1,278.0	1,319.0	1,605.3	4.7
Automotive	1,075.1	1,127.8	1,516.9	7.1
Others	852.3	864.7	976.9	2.8
Total	21,033.4	22,022.0	30,448.2	7.7

For emerging laser technologies, extreme ultraviolet lithography is one of the most critical breakthroughs in the semiconductor industry that enables the fabrication of very small (<2 nm) transistors to manufacture integrated circuits. Meanwhile, mid-infrared lasers are finding use in environmental monitoring and medical diagnostics.

The industrial sector is the biggest user of laser technology mainly because of its widespread use in activities such as cutting, welding, engraving, drilling, and 3D printing. However, lasers are increasingly used in surgeries, skin treatments, eye care, and cancer treatment due to femtosecond and picosecond lasers making medical treatments more precise (Table 1).

In 2023, the Asia-Pacific region held the largest share of the global laser technology market, accounting for 51.9%. The region's continued growth is primarily driven by consistent adoption and innovation in the semiconductor and industrial sectors. However, Canada and Mexico are emerging as key markets for semiconductor laser manufacturing and photonics research.

About the author

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