directphotonics

Ultra-High Brightness Diode Lasers

Disruptive Technology for Industrial Applications

COMPANY

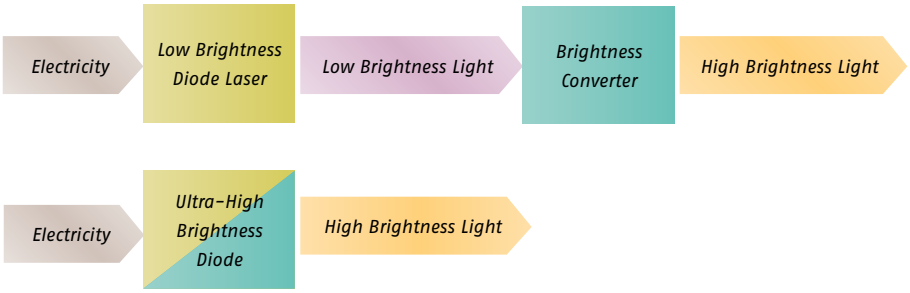
Our focus is on providing fast-growing industrial markets with innovative, flexible, customer-specific solutions built on small, robust, manufacturable, multi-kW range lasers.

Established in 2011, DirectPhotonics' powerful and affordable solutions are redefining the industrial laser industry. Leveraging patented Fraunhofer technologies, we develop, manufacture, and sell ultra-high brightness, high-power diode lasers for use in micro and macro materials processing applications.

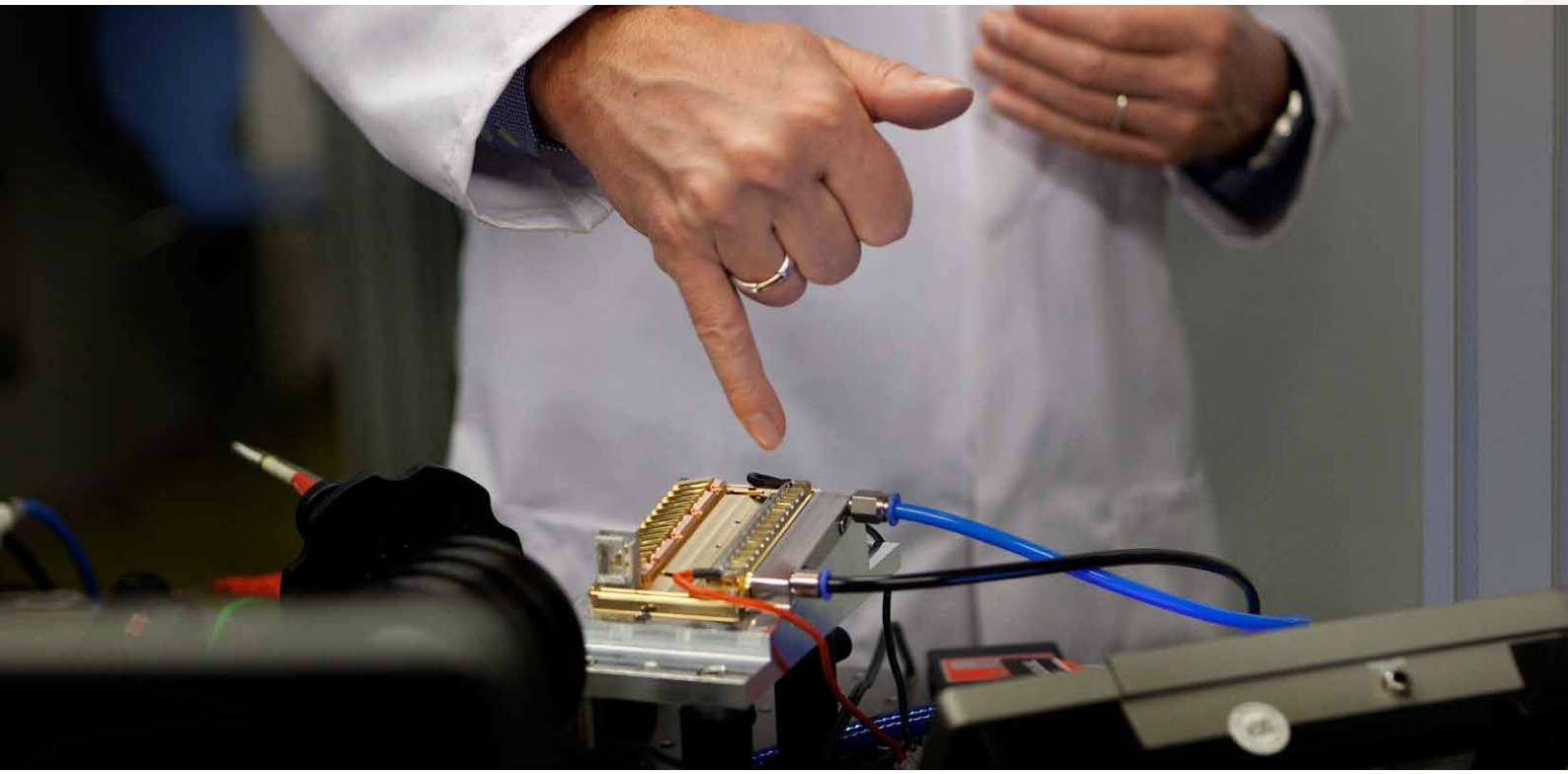
DirectPhotonics is headquartered in Berlin Adlershof, Germany's leading science and technology park, where we benefit from close proximity to leading research institutes and optics companies. And with our subsidiary located in Northern California, we are tapping into Silicon Valley's entrepreneurial spirit and its wealth of laser experts, several of whom now work with DirectPhotonics on both sides of the Atlantic.

Wolfgang Gries, a laser industry veteran with roots in both Berlin and California, founded DirectPhotonics with the goal of offering a high-power diode laser, with a beam quality rivaling that of fibers and disks, for use in industrial cutting and welding applications. The team of 20 he assembled has vast experience in the laser industry, both in building high brightness diode lasers and in automatically assembling laser systems, thus assuring high reproducibility and reliability.

Our lasers convert electricity into high brightness light without using fibers or disks to enhance brightness



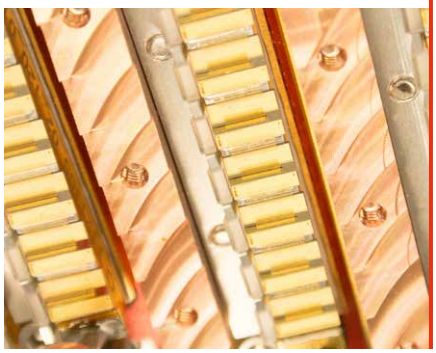
Single Emitter Based Ultra-High Brightness Diode



Meet some of our team members

TECHNOLOGY

DirectPhotonics' innovative industrial, high-power diode lasers unite high beam quality, similar to that of disk and fiber lasers, with a compact, robust design and improved manufacturability and serviceability.



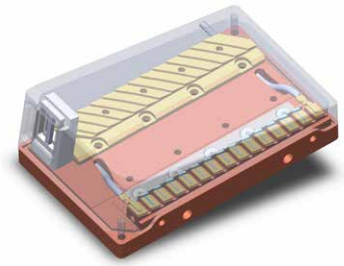
German precision optics

Single Emitters for Highest Brightness
DirectPhotonics' lasers are based on telecom grade single emitter diodes. Each diode delivers up to 12 watts and requires a low drive current. Due to the low current, we can easily modulate the lasers with very high pulse-to-pulse frequency up to 50 kHz. The low current requirements also allow for the use of various cost-effective power supply options. Finally, single emitter chips are established components, available from various suppliers at many different wavelengths, with exceptional reliability, ensuring the highest reliability at the lowest cost.

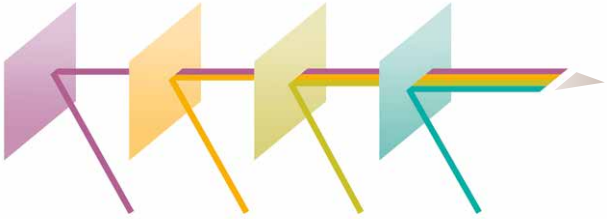
Optical Stacking and Dense Wavelength Multiplexing
The challenge is to combine single emitter diodes to generate multi-kW systems. We have licensed a technology developed by the German Fraunhofer Institute for Laser Technology and its US subsidiary in Plymouth, MI that allows us to efficiently combine diodes, by accessing the highest brightness from the single emitters.

Several steps are used to overlap the light from the individual diodes. First, the diodes are optically stacked; then, many slightly different wavelength lasers are overlapped with the help of gratings and thin-film filters.

Both steps are key to DirectPhotonics' technology. The optical stacking is automatically performed in a pick-and-place machine, allowing for cost-effective and reliable manufacturing. The dense wavelength combining allows power to be added to the laser beam without losing the ability to focus the ultra-high brightness diode laser to the small focus necessary for metal processing.



Combined laser beam
Laser beams of the modules separated by a $\Delta\lambda < 4$ nm.



DirectProcess
Available as a turnkey system or an OEM light engine, our DirectProcess lasers are tailored for use in micro and macro material processing applications, have power levels of 500 W, 1 kW and 2 kW, and are scalable to higher power levels. The beam parameter product at all these power levels is 7.5 mm•mrad when fiber-delivered, and 6 mm•mrad when operated with free space optics.

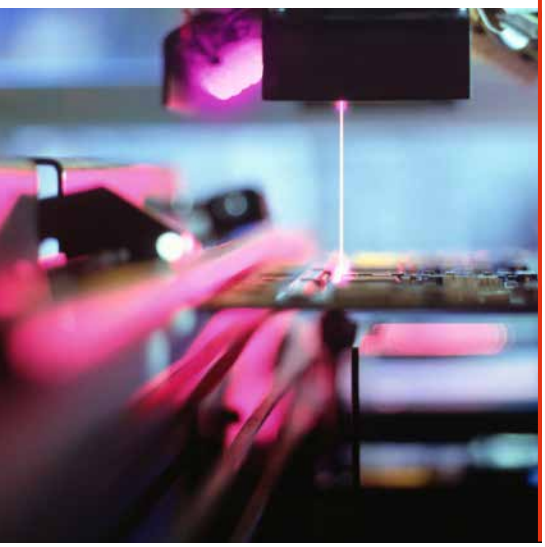
DirectLight
A 19" rack-mount, turnkey system with up to 200 W from a 200 µm fiber, the DirectLight system is ideally suited for thin-metal welding, soldering, and plastic welding.

DirectPump
A VBG stabilized optical pump laser available at 9xx and 15xx nm, the DirectPump rack-mounted system is perfect for novel DPSS solutions such as resonant Er:YAG pumping.

DirectBond
A fiber coupled 808 nm air cooled 19" rack-mount, turnkey system with up to 60 W equipped with pilot laser, the DirectBond system is ideally suited for high thropughtput industrial manufacturing as FRIT Welding, therm processing tasks soldering and plastic welding.

APPLICATIONS

DirectPhotonics' ultra-high brightness diode lasers are tailored for use in micro and macro-materials processing applications.



CUTTING

Flat bed sheet metal and 3-D robotic processes

DirectPhotonics' state-of-the-art, ultra-high brightness direct diode lasers are truly a next generation tool. Using the simplicity of passive optics and back reflection-resistance laser diodes, our lasers enable cutting system integrators to leapfrog the technology of fiber and laser resonators as well as high-power splices.

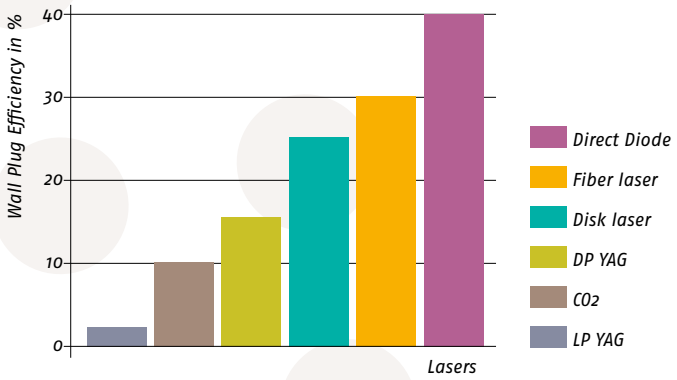
Built for industrial applications and perfectly suited for sheet metal cutting, our ultra-high brightness direct diode lasers offer a beam parameter product of 7.5 mm*mrad in the 1 micron wavelength range – a first for direct diode lasers. With output power that can be scaled up to 4 kW using cigarette carton-sized building blocks of up to 500W each, our lasers allow systems integrators to tailor the source specifically to their customers' needs. And because fiber delivery lends itself to robotic integration, DirectPhotonics' lasers are the perfect source for 3-D or freeform cutting applications such as those used in the automotive industry, where low cost, high efficiency, and small size are important features.

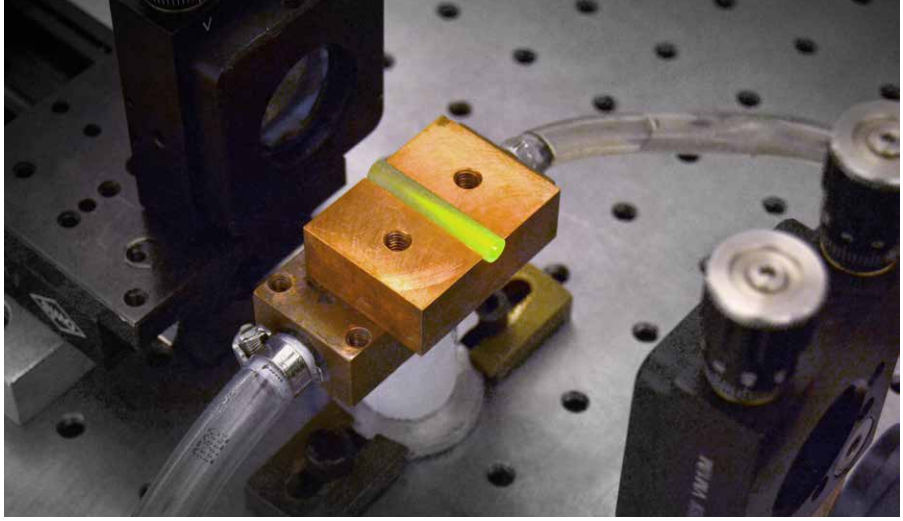
JOINING

Welding, Brazing, Soldering, FRIT Cell Sealing

As laser welding and brazing gains popularity in applications from body-in-white welding/brazing to high-speed tube and medical device welding to the sealing of Li-Ion batteries, lasers are now replacing TIG even in low-cost applications.

Driving this trend, DirectPhotonics' new ultra-high brightness direct diode lasers deliver a source that is reliable, compact, and offers low cost of ownership. In addition to increasing the working distance, high brightness welding lasers allow for remote welding and enable true, narrow keyhole welds. And because we know reliability matters, DirectPhotonics' direct diode lasers offer superior performance when it comes to tolerating the back reflections common to welding materials such as copper/aluminum joints on Li-Ion batteries. Similarly, DPI's medium power, turn-key systems are a perfect fit for joining applications, such as FRIT welding or PCB soldering, used in electronic manufacturing. DPI offers solutions for everyone – from the weld system integrator starting his own product line to the welding engineer looking for a new solution.





LASER ADDITIVE MANUFACTURING

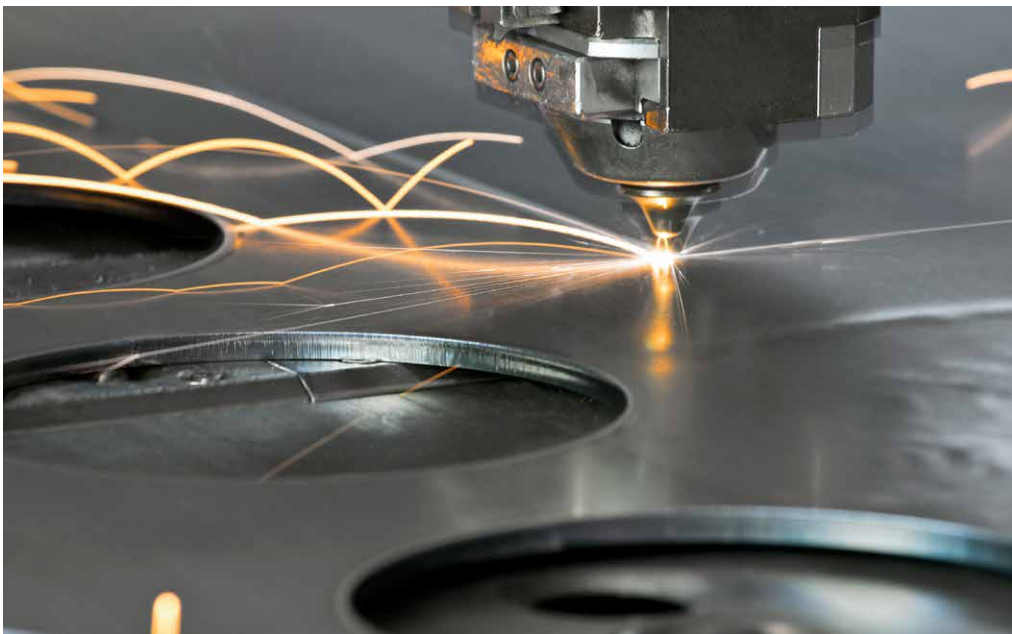
3D Printing, Rapid Manufacturing and Prototyping, Repair Welding
With the advancing technology of laser additive manufacturing, functional parts can be created from powdered material or wire by laser melting. Beyond allowing for rapid prototyping, this technology is aggressively making inroads into several industries, with aerospace applications leading the way.

In an environment where speed, efficiency, and reliability are crucial, DirectPhotonics' compact, ultra-high brightness direct diode lasers are the key to success. Small spots allow for near net-shape manufacturing and the generation of intricate geometries; efficient design reduces the size and cost of the systems; and robustness provides access to a wide range of metals and other materials. And for those applications requiring only a few hundred watts, a compact light engine with DirectPhotonics' high brightness technology can be easily integrated with the powder nozzle.

ADVANCED PUMP SOURCES

Fiber Lasers, Disk Lasers, Advanced DPSSL
At the heart of every fiber laser, disk laser, and other DPSS laser is a diode pump. By working with developers to improve the pump source, DirectPhotonics' can increase the performance of these lasers. Efficiently pumping into the gain media's narrow absorption lines requires narrow bandwidth, a precisely stabilized center wavelength, and resistance to temperature fluctuations and power variations.

All of DirectPhotonics' advanced pump sources are optically stabilized, and because the patented, single-emitter multiplexing leads to an ultra-high brightness pump, higher gain is achieved. Whether using 976 nm to take advantage of the lower quantum defect and the larger absorption cross section leading to shorter Ytterbium fibers or using 15xx nm pumps for high efficiency pumping of Erbium eye-safe lasers, DPI has the right pump source for the application.



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