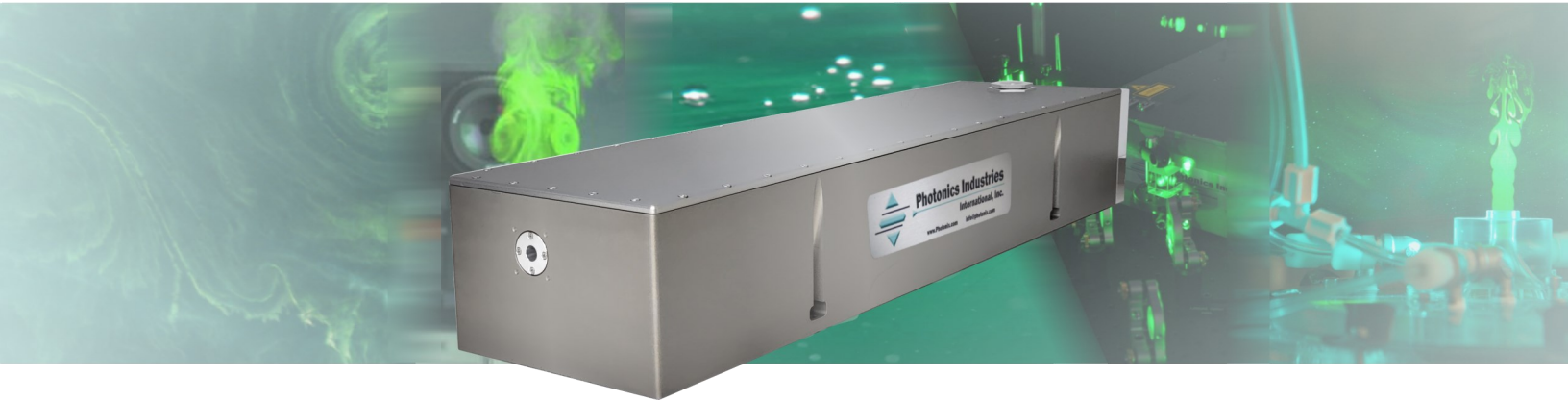


# Applied Lasers for PIV

Photonics Industries' DMX Series Lasers — Optimized for Particle Image Velocimetry (PIV)

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## DMX Series Lasers Optimized for PIV Applications

Photonics Industries' DMX Series lasers are specially optimized to help acquire velocity vector information of particle flows in liquids and gasses. Utilizing the laser light produced from the DMX Series lasers, particle flows are perfectly illuminated for image capture by high speed cameras. This imagery data transduced into vector maps thus enlightens understanding of fluid dynamics.

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Perfect cross-correlation from proprietary twin pulses

Short pulse duration accommodating fast flows

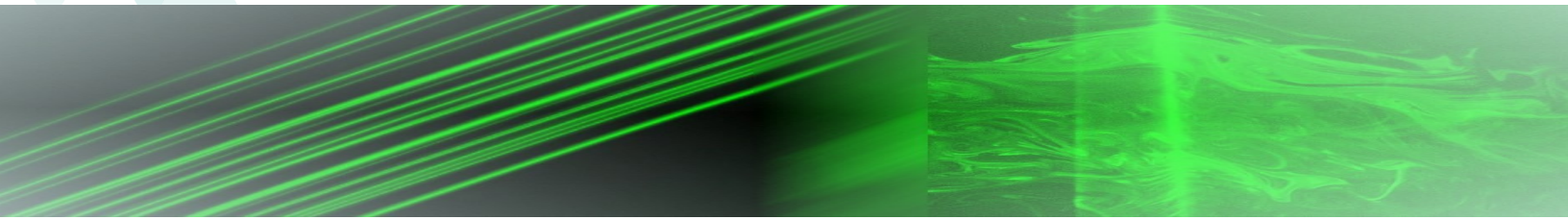
Excellent energy stability for reduced noise,  
pulse to pulse stability <0.5% rms

Patented highest pulse energy green laser, up to 100 mJ

Optimal beam profile for homogeneous illumination  
and light sheet generation

High reliability with diode lifetime of >10,000 hours

Compact form factor, available in both  
Single Head and Dual Head configurations



## A Proven Laser for Research Worldwide

Photonics Industries' DM Series lasers have been utilized and implemented in many PIV systems for decades. The newest DMX Series improves on its predecessor while retaining the core design that has made it the perfect choice for PIV systems worldwide.

*a sampling of institutions with successful use of the DM laser in their systems for research*

**Cornell University • Stanford University • Stony Brook University • Princeton University • Physics Institute in Taiwan • California Institute of Technology • Max-Planck Institute • Johns Hopkins University • University of Leeds • Massachusetts Institute of Technology (MIT) • Technical University of Vienna • University of California, Berkeley (U.C. Berkeley) • University of California, Los Angeles (UCLA) • University of Calgary • University of Florida • Russian Academy of Sciences • Texas Technical University • Chinese Academy of Sciences • University of Jülich • University of Wisconsin • Tokyo University • University of Chicago • Indian Institute of Technology • University of Rochester • Technion-Israel Institute of Technology**

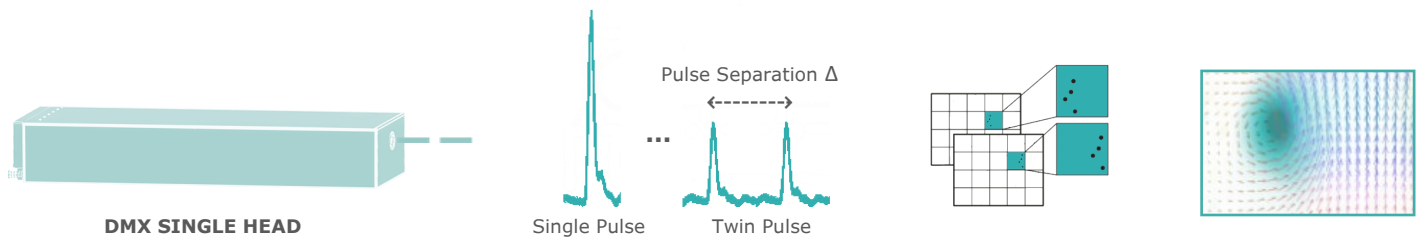
*and many more...*

## Uniquely Designed for Perfect Cross-Correlation

Photonics Industries' DMX Series lasers feature a proprietary Twin Pulse mode option\* which configures the pulses to be generated in pairs with a calibrated pulse energy ratio. In this mode, every external or internal pulse repetition frequency trigger can generate a pair of pulses with a controllable pulse energy ratio and a controllable pulse separation (down to 1  $\mu\text{s}$  for the DMX Single Head, and  $< 1 \mu\text{s}$  for the DMX Dual Head).

Coupled with uniform beam profiles and excellent stabilities (pulse to pulse stability  $\sim 0.5\%$  rms), the DMX Series twin pulses help to form ideal light sheets for PIV cross-correlation, wherein velocity vector measurements are formulated and visualized for fluid dynamics observations.

\* US Patents #6,980,574 Short pulse separation laser, #6,961,355 Pulse Energy Control Apparatus



## Optimally Compact

Photonics Industries' proprietary single laser resonator design\* is advantageous for the PIV user because this method guarantees collinear output of the laser pulse sets, as well as the plane of polarization—all within a compact, simple, monolithic laser head.

\* US Patents #7,346,092 Diode side pumped high pulse energy Nd:YLF lasers , #7,082,149 High power diode side pumped solid state laser



## Ease-of-use

Photonics Industries' DMX Series lasers are ideal for all environments, whether the application be in a lab for research or in a rugged industrial setting, the DMX Series laser holds up to the task. Having a plug and play, quick start design, time of implementation is highly reduced. For research, with easily changeable repetition rates by the user (single shot to 10 kHz), the DMX Series provides the ultimate adaptability.

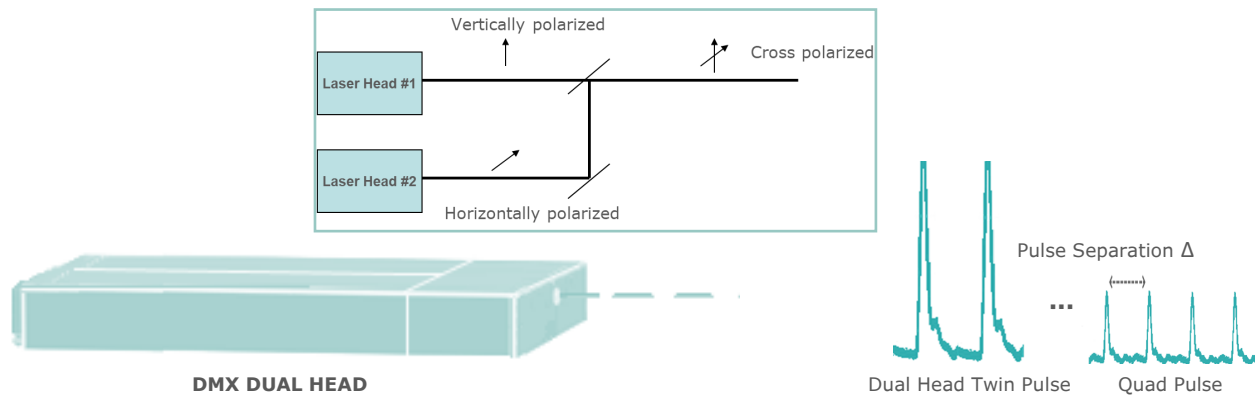
## Flexibility of Pulse Separation

As Photonics Industries' DMX Series lasers feature the proprietary Twin Pulse mode option\*, configuring to a Dual Head setup achieves a Quad Pulse (four pulses from one trigger signal) with more flexibility for even shorter pulse separations (from  $< 1 \mu\text{s}$  to complete beam overlap for the DMX Dual Head). As with the Twin Pulse, the Quad Pulse also configures the pulses to be generated in groups of four with a calibrated pulse energy ratio.

The pulse energy ratio and pulse separation are user-controllable. Also, the beams are adjustable because the Dual Head configuration is the combination of two identical laser heads outputting to an external beam combination box.

Again, coupled with uniform beam profiles and excellent stabilities, the DMX Series Dual Head quad pulses provide the advantage of polarization, energy, and alignment independence. Overall, what is sacrificed in the compactness of the DMX Single Head is gained in user-flexibility.

\* US Patents #6,980,574 Short pulse separation laser, #6,961,355 Pulse Energy Control Apparatus



## High Energies and High Powers

For applications requiring higher energies or higher powers, Photonics Industries' DMX Series lasers Dual Head configuration is offered to provide up to 200 mJ at 1 kHz (Nd:YLF), and up to 400 W at 10 kHz (Nd:YAG). Dual Head configurations are available on all DMX models.

## Highly Reliable and Long-lasting

Photonics Industries' historical DM Series lasers have a highly reliable track record of long-term uses and high mean time between failure (MTBF). The new DMX Series design only requires a single power supply, with the driver relegated to the laser head and controls transferred to a software GUI for increased operability. With fewer components, the reliability of a single head laser configuration far surpasses the industry standard dual head configuration and large controller combination in both reduced maintenance cost and, having  $< 1\%$  service call requests within the warranty period in the latest 24-month statistics, increased mean time between failure (MTBF). Further, the general diode lifetime for the DMX Series lasers is greater than ten thousand hours, and even, in a recent case, up to  $\sim 44,000$  hours.

# DMX Series Nd:YAG & Nd:YLF Lasers

Available in the Green and Ultraviolet wavelengths.

## Diode-pumped Solid-state Lasers for Research and Industry...

Photonics Industries' DMX Series Nd:YAG or Nd:YLF lasers offer the most simple, efficient, compact platform to deliver high power (Nd:YAG) or the highest pulse energy at 527 nm wavelength (Nd:YLF) optimal for scientific applications such as Particle Image Velocimetry (PIV) and pumping Ti:Sapphire amplifier systems. The DMX Series is highly reliable and low maintenance, owing to its compact form factor, which makes it highly suitable for annealing, cutting, and drilling of hard materials.

The DMX Series is the technologically superior choice in the market, especially for PIV and pumping Ti:Sapphire amplifier systems, owing to its patented technologies, outstanding thermal management, user-changeable repetition rates (single shot to 10 kHz), and proven reliability (<1% service call requests within the warranty period in the latest 24-month statistics).



## Features

- Patented highest pulse energy green laser from single resonator, up to 100 mJ
- Simplest, most efficient, compact monolithic laser head
- Diode lifetime of greater than ten thousand hours
- Single Head pulse energy up to 100 mJ (Nd:YLF) or high power up to 200 W (Nd:YAG). The Dual Head configuration doubles the performance to 200 mJ and 400 W respectively
- Optimized for PIV and Ti:Sapphire amplifiers
- Proprietary Twin Pulse mode option
- Uniform beam profile with excellent stabilities
  - Pulse to pulse stability ~0.5% rms
- Exceptional Repetition Rate Control:
  - User-changeable repetition rate from Single shot up to 10 kHz (Nd:YLF) and 1 kHz up to 50 kHz (Nd:YAG)
- For even higher pulse energy or sub-microsecond pulse separation, Dual Head configurations are available on all models

## Applications

- Particle Image Velocimetry (PIV)
  - High Speed Time Resolved PIV, Stereoscopic PIV, Volumetric Illumination (3D) PIV, Laser Tomography, Planar Laser Induced Fluorescence (PLIF), Interferometric Particle Imaging (IPI), and other analysis techniques that require single or multi pulsed laser light sheet illumination
- Pumping Ti:Sapphire Ultrafast Amplifier Systems
- High power or high pulse energy cutting and drilling of hard materials
- Annealing or "Bleaching"

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光と人をつなぐ

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