

# **Advanced Picosecond Laser Technology: High-Energy Pulse Generation in Compact All-In-One Form Factors**

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This presentation explores recent sub-10 picosecond laser technology advancements, focusing on high-energy pulsed lasers in compact, All-In-One form factors. We will examine the cutting-edge engineering behind these laser sources, emphasising systems optimised for very high pulse energy across multiple wavelengths, including fundamental NIR, Green, and UV wavelengths.

The presentation will delve into the novel optical designs that enable high-energy picosecond pulse generation within a significantly reduced footprint compared to traditional systems. We'll explore key components and architecture facilitating this miniaturisation without performance compromise, including advanced gain media, innovative pumping schemes, and highly efficient cavity designs. This is enabled by using proven existing optical sub-assemblies to achieve efficiencies in production scaling and reliability. Special attention will be given to harmonic generation techniques for conserving high pulse energies in Green and UV wavelengths using a true monolithic design without using bolt-on modules.

We'll highlight these systems' ability to deliver high-energy individual pulses and burst-mode operation, offering an unprecedented level of flexibility. The presentation will address methods to achieve and control these pulse characteristics and discuss challenges overcome in maintaining beam quality and stability at high energies.

Detailed performance metrics will be presented, demonstrating how these compact lasers compete with or surpass larger systems in pulse energy across all spectra while offering advantages in size, energy efficiency, and thermal management. We'll also discuss the implications for system integration, particularly in space-constrained industrial environments requiring multiple wavelengths, to keep you informed about the practical applications of this technology.

While focusing primarily on laser technology, we'll briefly explore potential micro-processing, marking, and drilling applications, showcasing how combining high pulse energy and compact design creates new possibilities in these fields.