

LONG-PULSE, HIGH-ENERGY Nd:YAG/ALEXANDRITE LASER SYSTEM.

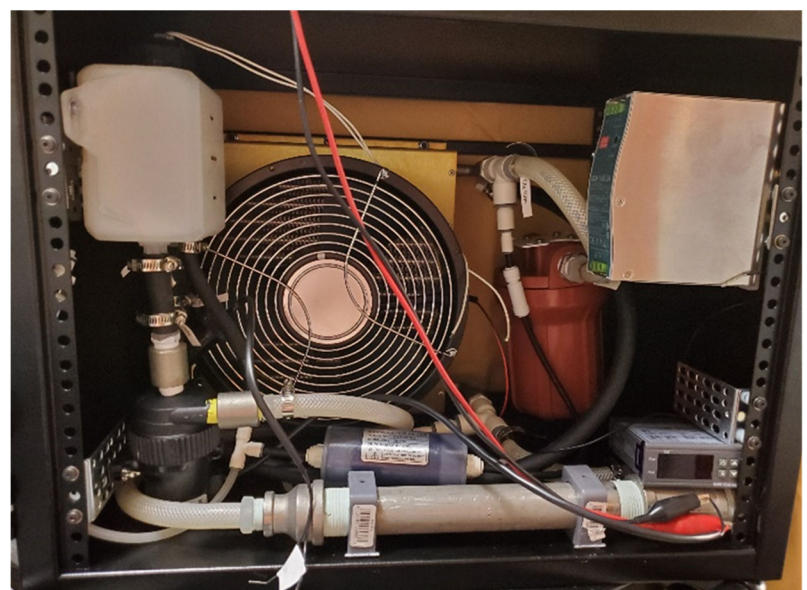
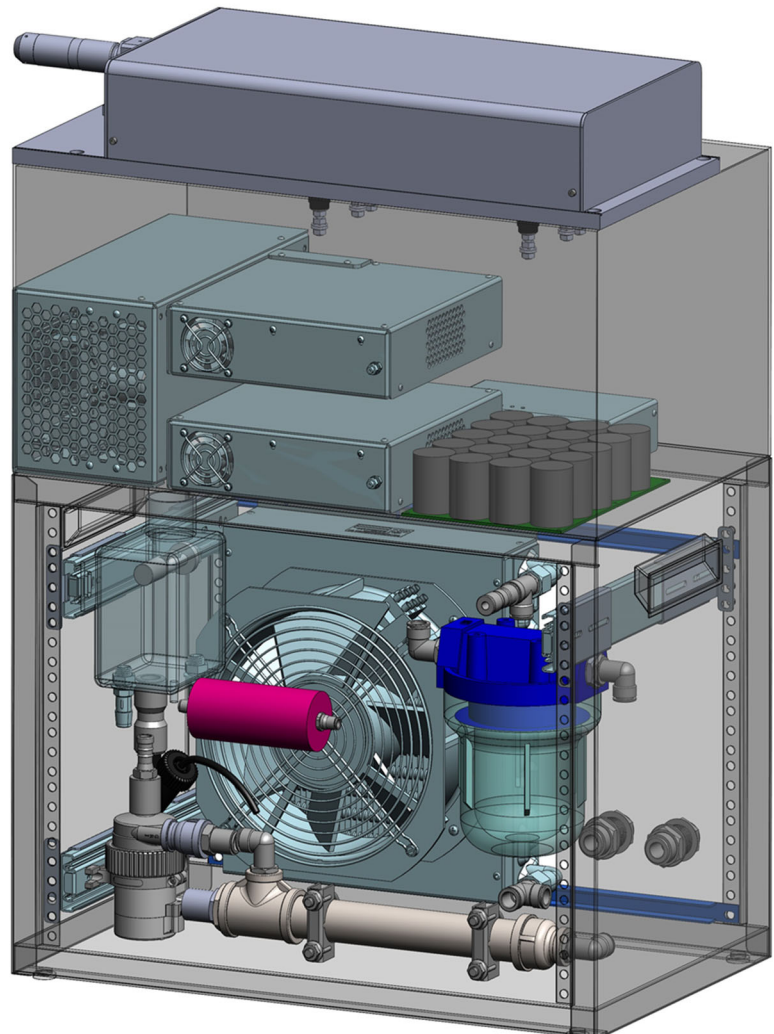
DESCRIPTION & DISTINCTIVE FEATURES.

Vigitek, Inc. has designed a high-performance, OEM LP Nd:YAG/Alex Laser that can be readily converted into a commercial product. It will only require industrial design with covers, and GUI with software. This is usually customized by every individual company to their preference.

The laser has a standard 3-level configuration, with the cooling/heating system located on the 1st floor, power electronics in the middle, and laser head with beam delivery interfacing on the top level (see the image to the right).

State-of-the-art Heating/Cooling system allows for a quick automated switching between cooling mode for the Nd:YAG Laser to heating regime for the Alexandrite Laser thanks to a powerful in-line water heater. Initially it operates continuously until temperature reaches 70°C; afterwards it maintains the temperature through on/off cycle, as during steady-state operation the main source of heat comes from the running flashlamps of Alexandrite pump chamber.

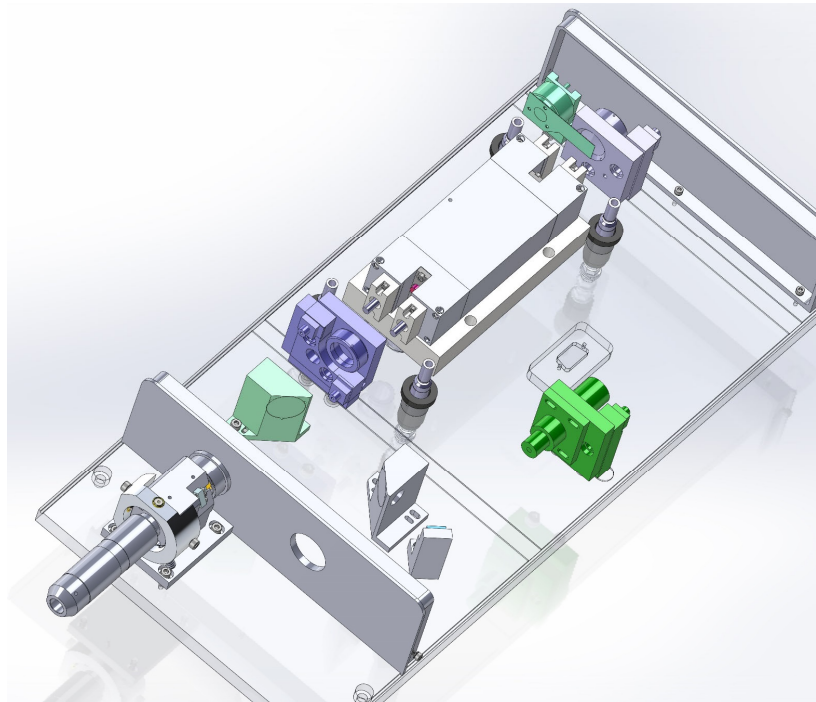
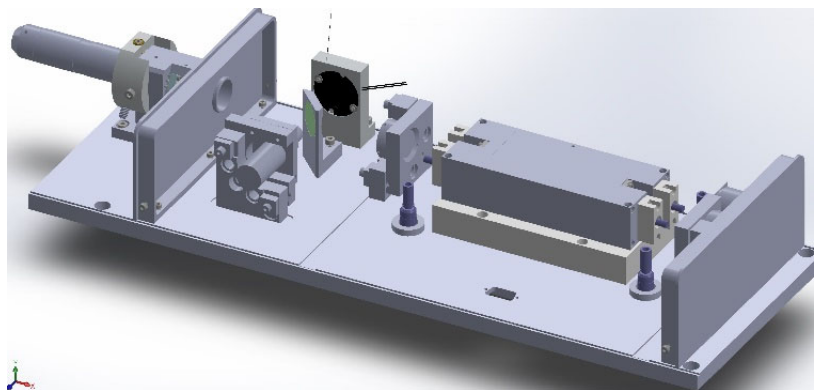
The power supply has 4000Watts output power rating, required to achieve laser output energy in excess of 100 Joules/pulse from *both Alexandrite and Nd: YAG Laser heads*, with peak powers on the order of 20-25 kW. High reliability is achieved by unique topology that employs



twin IGBT discharge circuits, - one for each flashlamp (as opposed to arranging lamps in series/parallel, as normally done in most competitive lasers). These modules are rated up to 1500 Amps of peak current and have a significant operational margin even at the highest voltage settings. Burned IGBTs is the main limiting factor that does not permit achieving output energies (particularly in Alexandrite), exceeding 60-70 Joules/ pulse, and is the primary source of power supplies' breakdown. We also make our own electrolytic capacitor banks in the form of PCBs, which allows us to achieve higher packaging density when compared to conventional, tall cylindrical banks of high capacitance.

Finally, the laser head design also has several distinctive features:

- Identical size laser rods and dual-lamp pump chambers, allowing for quick & straightforward replacement;
 - Close-coupled reflector geometry with lasing slope efficiencies close to 4.5%;
 - UV-blocking filters for solarization prevention and thermal lensing mngmt;
 - Long-lasting, virgin PTFE rods' seals;
 - Flashlamps' operational lifetime – from 500K to 1M shots (depending on the output energy level);
 - Single Optical Fiber beam delivery arrangement for both 755 and 1064nm;
 - Bright green aiming diode;
 - Safety Shutter for each resonator;
 - Built-in Internal Power Detector/ Calibration Port
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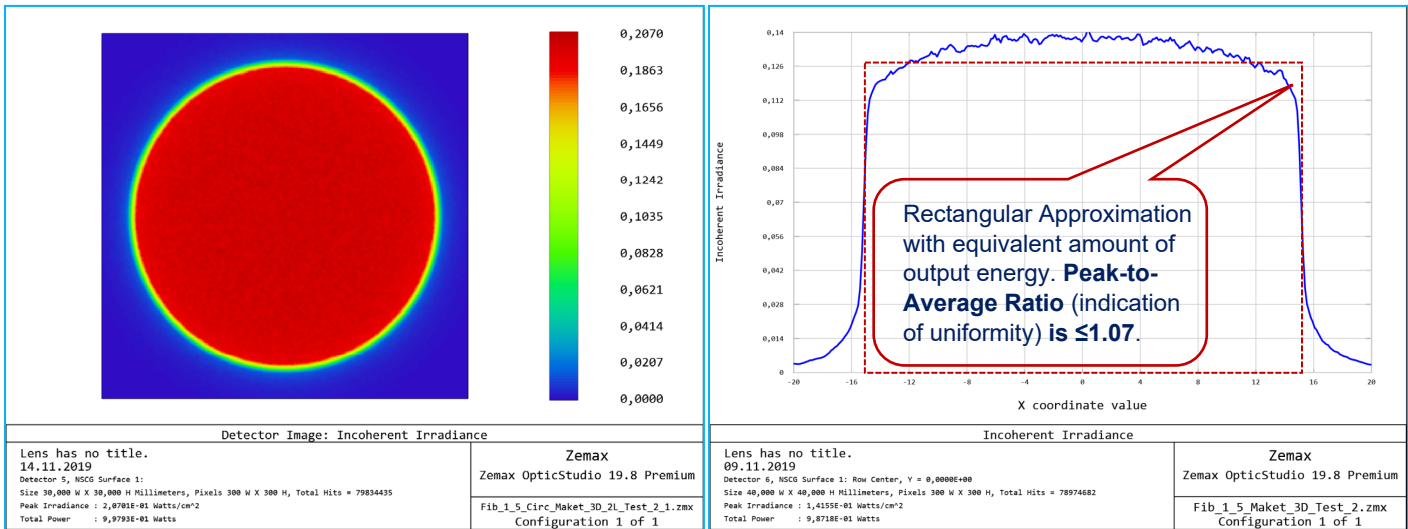


TECHNICAL SPECIFICATIONS.

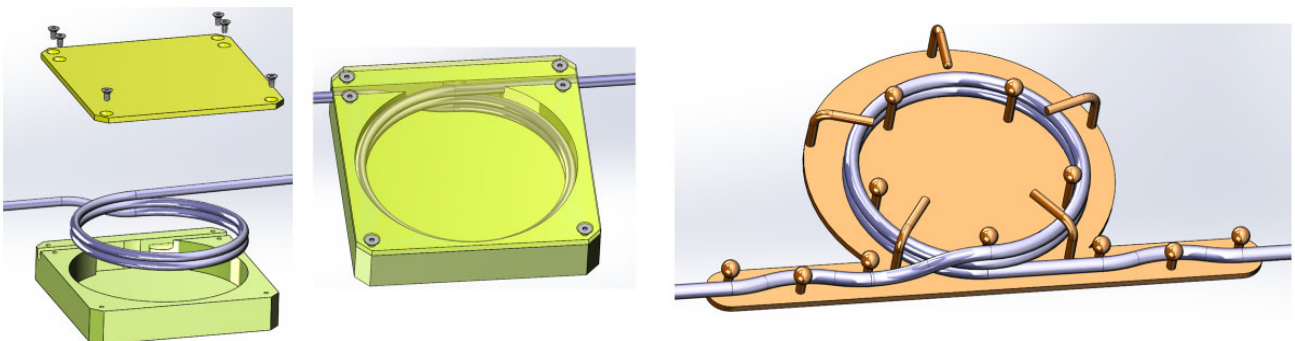
• WAVELENGTH I	755NM (ALEXANDRITE LASER)
• WAVELENGTH II	1064NM (ND:YAG LASER)
• OUTPUT ENERGY PER PULSE I	UP TO 100 J (ALEXANDRITE)
• OUTPUT ENERGY PER PULSE II	UP TO 100 J (ND:YAG)
• PULSE DURATION	250µSEC...5MSEC (CONTINUOUS), 5-50MSEC (QUASI-CONT.)
• AVERAGE OUTPUT POWER I	UP TO 100 W (ALEXANDRITE)
• AVERAGE OUTPUT POWER II	UP TO 100 W (ND:YAG)
• PULSE REPETITION RATE	SINGLE-SHOT TO 10Hz
• AIMING BEAM	20MW/532NM
• BEAM DELIVERY ARRANGEMENT	SINGLE FIBER OPTIC CABLE, 1000µM CORE X 3300MM L
• HANDPIECE	MANUAL ADJUSTMENT, SPOT SIZE RANGE 3.0 – 30.0 MM
• SKIN COOLING	CRYOGENIC SPRAY OR COLD AIR JET
• CALIBRATION	THERMAL POWER DETECTOR, BUILT INTO LASER HEAD
• VOLTAGE	230VAC
• TOTAL POWER CONSUMPTION	<6.0kW
• DIMENSIONS	400MM W X 700MM D X 900MM H

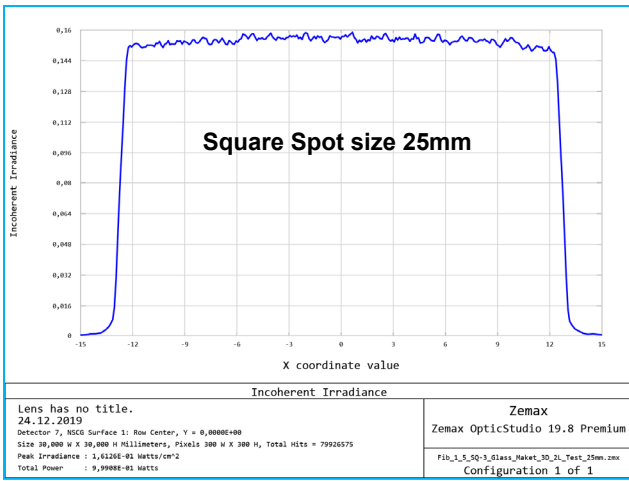
PERFORMANCE AND OUTPUT PARAMETERS.

- BEAM UNIFORMITY (HANDPIECE EXIT).

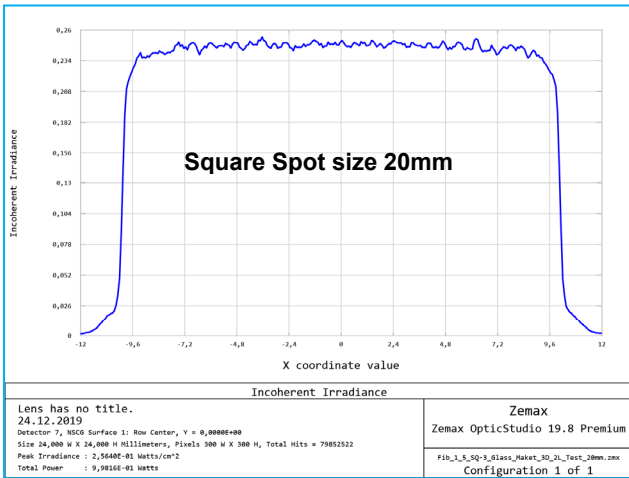
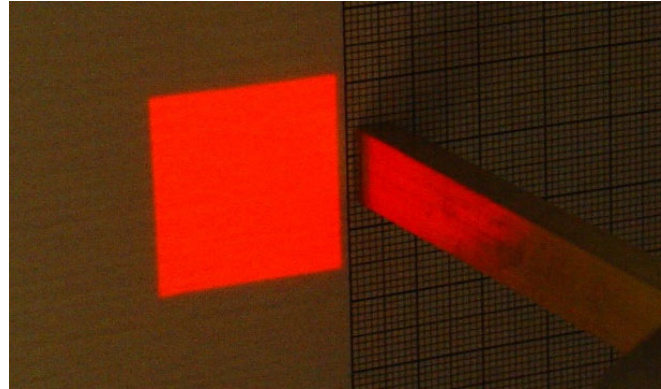


Obtaining such a uniform profile requires “scrambling” of the laser beam as it propagates through the fiber cable. These are some of the “scramblers” that we used in previous designs:

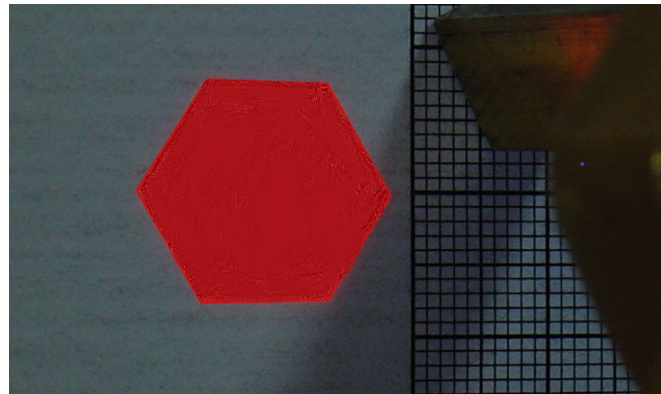




After placing an additional square homogenizing bar into the handpiece, further improvement of the beam profile was achieved:



Corresponding patterns have also been obtained for the homogenizing rod of hexagonal cross-section:



OUTPUT ENERGY VS VOLTAGE AND PULSE DURATION (FOR THE LP ALEXANDRITE LASER):

E_{OUT} Vs Δt @550V; 55°C cooling water.

