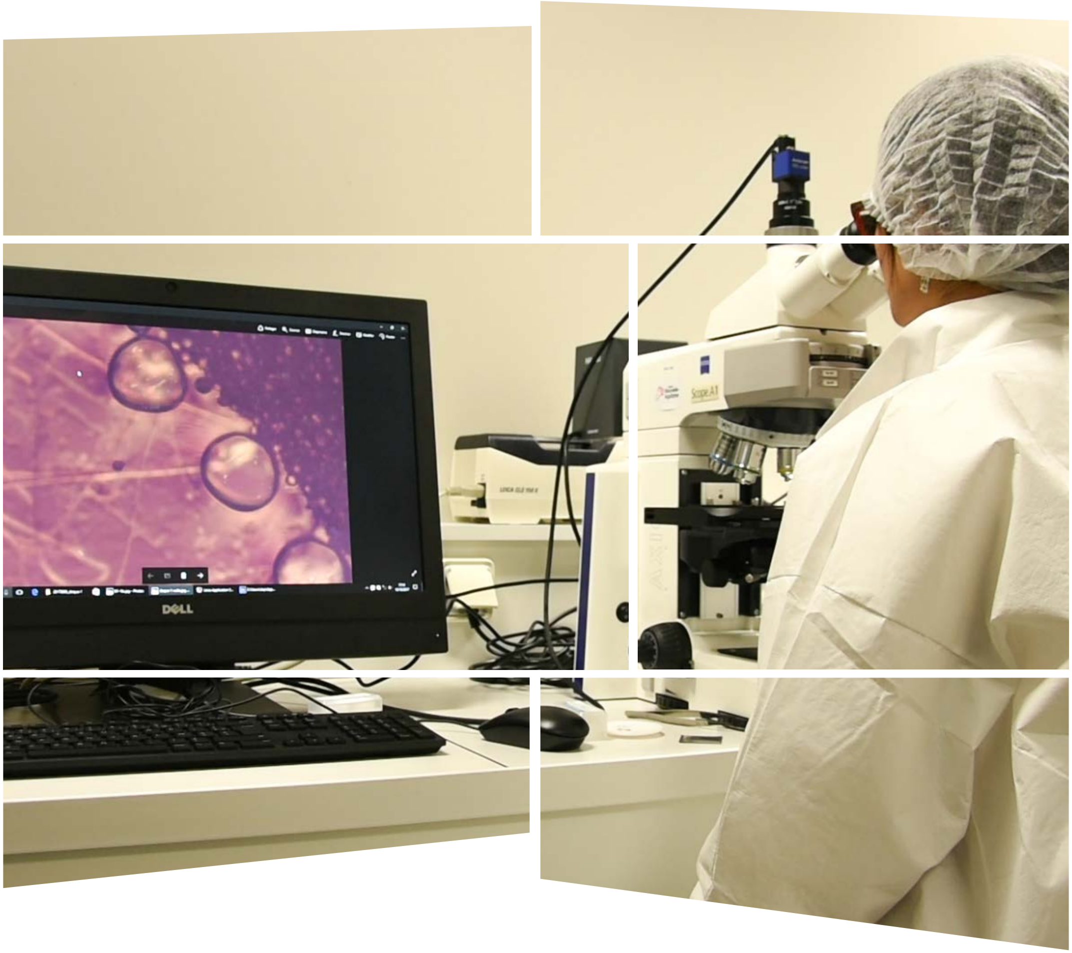
OPTICAL COMPONENTS FOR HIGH POWER SOLID-STATE LASERS



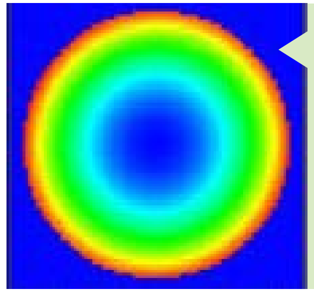
ALPhA NOV
Optics & Lasers Technology Center

www.alphanov.com

Optical surface analysis

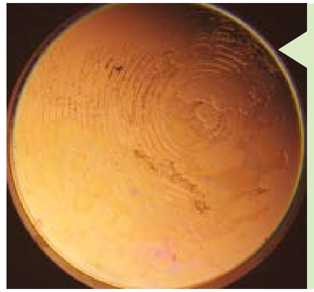
High power optics are very sensitive to surface defects. Small defects, not easily detectable by eye inspection, can be the cause an optical failures. Moreover, large beam diameters can accumulate significant residual wavefront aberrations when subjected to thermal or mechanical load.

RADIUS OF CURVATURE



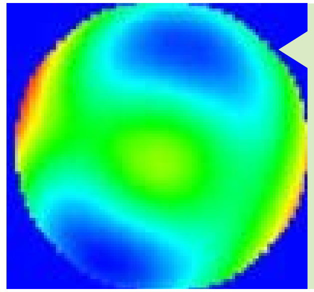
Optics with unknown radius of curvature can be accurately measured, whether convex or concave, from 2 to 50 m, for optics from 10 to 30 mm diameter.

SURFACE STATE



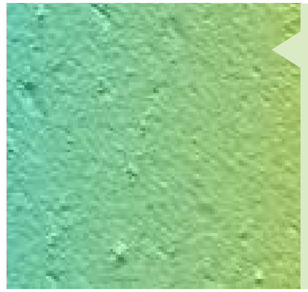
Presence of dust, organic contaminants, scratches and digs of an optical surface can be evaluated, preventing potential damages during high power laser operation.

RESIDUAL ABERRATIONS (TWE)



The transmitted wavefront error (TWE) of an optic can be evaluated on a large surface (up to 25 mm diameter), with a precision down to $\lambda/20$ at 633 nm.

SURFACE ROUGHNESS

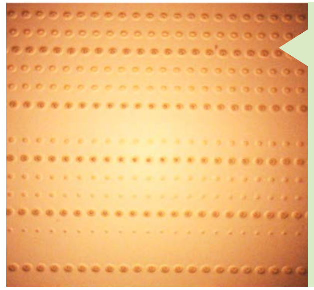


Precise surface roughness down to few nanometers can be easily measured with optical profilometry.

Laser damage testing

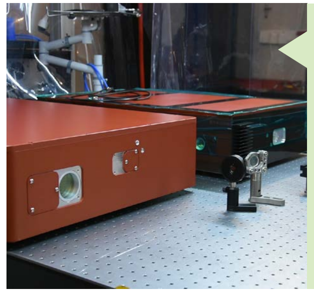
Everyone working in the field of high intensity lasers has had the unpleasant experience of damaging an optical component. Measuring precisely an optic LIDT allows to limit the damage risk before the actual experiment takes place.

STANDARD ISO 1-ON-1 TESTS



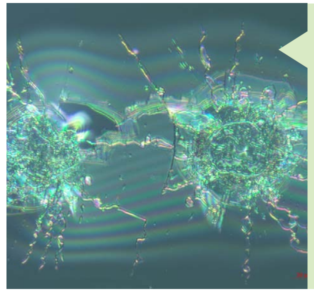
We provide standardized LIDT tests based on ISO-21254. Optics from different manufacturers can be easily compared to select the most resistant one.

LARGE RANGE OF AVAILABLE LASERS



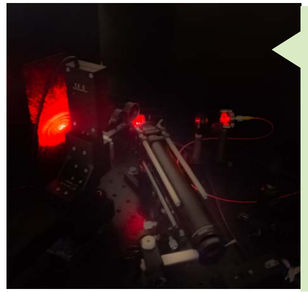
From low energy femtosecond laser, to joule-class nanosecond laser, we have access to a wide variety of test lasers, and we can adapt our test to your application.

COMPLEX LIDT TESTS



When standard 1-on-1 tests are not sufficient, we can go further and offer low-fluence LIDT tests dedicated to large surface testing (Rasterscan) or, >million pulses (S-on-1) long term tests.

RELIABLE AUTOMATIC TESTING



Our LIDT measurement set-up is fully automated, from the laser control to the diffusion-based damage counting. This way, we ensuring perfect repeatability for every test.

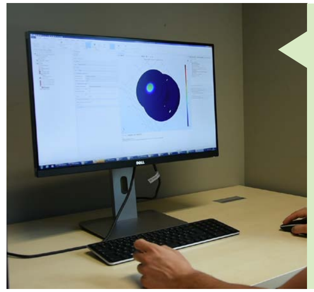
Thermo-mechanical engineering

High thermal loads can have drastic consequences on an optical system performances. Careful thermal optimization of the opto-mechanical parts becomes a requirement for high power applications.

DIAGNOSTIC

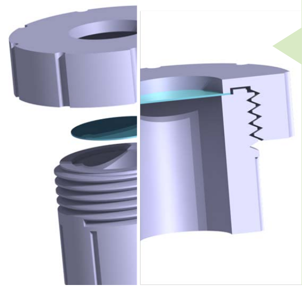
We are equipped with high resolution, high speed thermal cameras (up to 14 kHz frame rate) that can accurately evaluate the origin of unwanted thermo-optical effects.

FEM MODELING



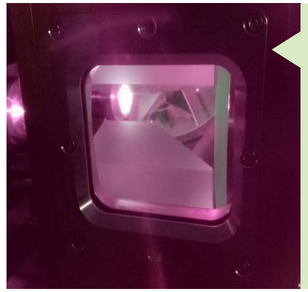
With a dedicated modeling station equipped with the latest FEM software, we can model the thermo-mechanical behavior of complex assemblies involving many different materials.

MECHANICAL ENGINEERING



Once the problem is evaluated, our engineers will design a dedicated part, or modify a preexisting using our strong knowledge in opto-mechanical components.

IN-SITU TESTS



We systematically test our opto-mechanical systems in dedicated test benches, measuring key parameters such as the thermo-mechanically induced wavefront error, long term pointing stability.

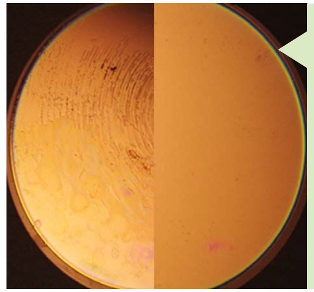
Process development

Some things cannot be modeled. ALPhANOV has developed a strong expertise in developing robust fabrication process for the functionalization of optical components.

BONDING

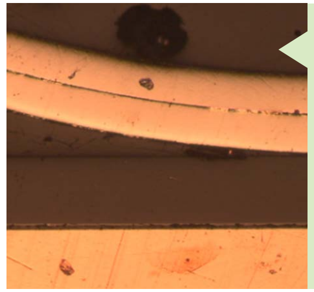
We can bond optics to a wide range of materials, choosing the best-suited process for your application, focusing on the reproducibility and long term stability of the bonded interface.

CLEANING



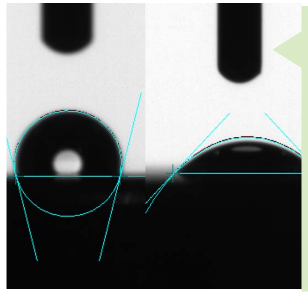
Our cleaning procedures are specifically adapted for high power lasers, where no residual dust or micro-scratch can be tolerated.

POST-PROCESS ANALYSIS



We have access to high resolution microscopes and MEB to evaluate precisely our processes quality.

SURFACE MODIFICATION

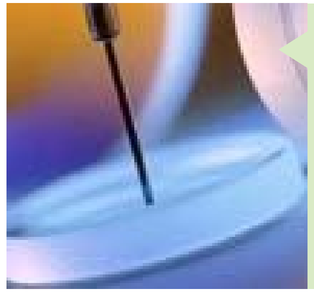


Different types of surface modification (plasma induced, laser treatment, etc) can enhance the surface properties and enable difficult processes to be realized.

Example: UV-glue bonding process for laser crystal

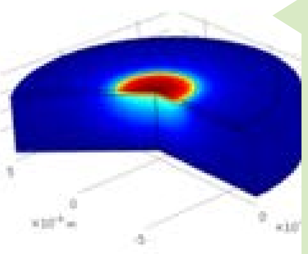
ALPhANOV has developed a state-of-the art bonding process for thermo-mechanical contacting of a laser crystal subjected to extremely high pump powers (kW-class).

ADHESIVE SELECTION



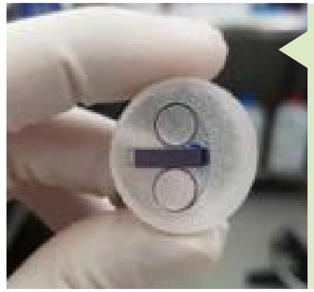
Adhesive is carefully selected depending on the optical specifications, thermal properties, and shrinkage percentage.

HEATSINK OPTIMIZATION



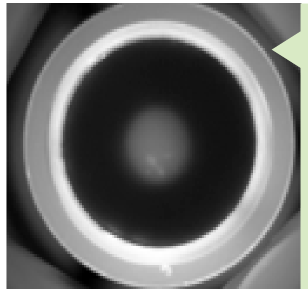
Finite-Element-Method model is built to determine the optimum materiel, thickness and cooling solution for the crystal heatsink.

BONDING PROCESS DEVELOPMENT



Careful optimization of the surface state, glue deposition method, and insulation time were conducted, and assessment of the process was verified with in-situ wavefront metrology and post-bonding glue thickness analysis.

LASER TESTING PLATFORM



A complete testing bench was built to measure simultaneously the thermal, optical and laser properties of the assembly when exposed to kW-class pumping regimes.

ALPhA NOV
Optics & Lasers Technology Center

www.alphanov.com

CONTACT

OPTICS & LASERS TECHNOLOGY CENTRER

ALPhANOV

Ph: +33 (0)5 24 54 52 00

info@alphanov.com

www.alphanov.com

Institut d'optique d'Aquitaine
Rue François Mitterrand
33400 Talence - France

MINISTÈRE DE L'ENSEIGNEMENT SUPÉRIEUR, DE LA RECHERCHE ET DE L'INNOVATION

Région Nouvelle-Aquitaine

ALPHA RLH

cnrs

université de BORDEAUX

cea

CRT Centre de Ressources Technologiques

ISO 9001:2015 BUREAU VERITAS Certification

Photos: ALPhANOV

ALPhA NOV

Optics & Lasers Technology Center