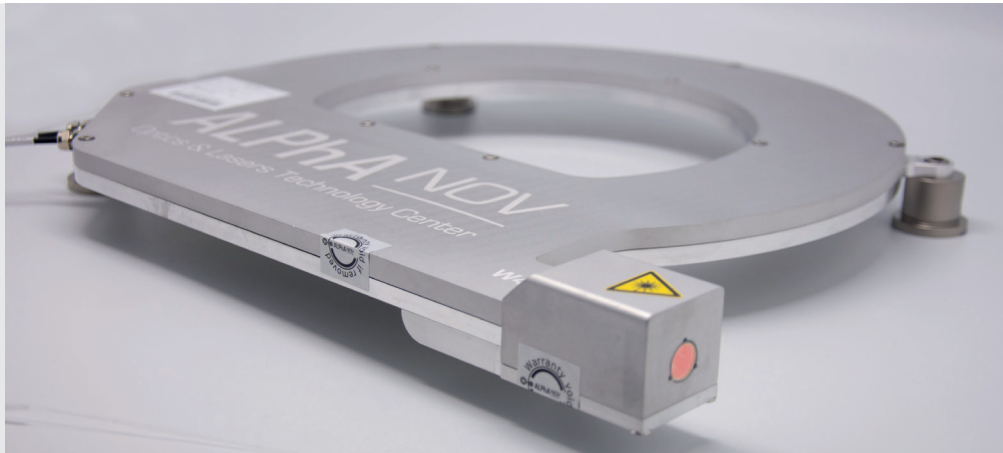


## LASER DEVELOPMENT ON THE FAST TRACK

ALPhANOV relies on the Ophir BeamSquared laser quality measurement



**ALPhA NOV**  
Optics & Lasers Technology Center

Anything but ordinary – that's how one could describe the work of the experts in the fiber laser division at ALPhANOV. The engineers at the Institute develop prototypes of ultra-short pulse laser systems, fiber amplifiers or other optical components. Their external partners use these as a basis for innovative applications, e.g. in ophthalmology or macro material processing. Often, large mode area (LMA) fibers are used, as these have a higher damage threshold and can transmit pulses at high power. This sophisticated development work requires reliable measurement methods. MKS Instruments' Ophir BeamSquared device for measuring beam caustics replaces their former measurement gauges delivering the relevant parameters reliably and a hundred times faster.

### Tailwind for photonics

The region around Bordeaux has more to offer than just good wines. Within the global laser community, Nouvelle-Aquitaine is considered a stronghold of laser technology in France. The foundation of ALPhANOV in 2007 contributed significantly to this, as the Technology Resource Center (TRC) was established specifically to strengthen the local photonics industry. And to great effect: Since 2007, researchers and developers have enjoyed repeated success in developing innovative technologies – and transforming them into market-ready products. Numerous start-ups have already been founded in the area around ALPhANOV, and this is where companies from all over the world contract to have their prototypes for lasers and optical fiber components developed.

As the laser technologies advance, so must the devices that measure them. However, engineers developing fiber lasers had thus far been quite disappointed with the available measuring devices, so they were looking for a better solution.

#### Product:

- Ophir® BeamSquared® Beam Propagation Analyzer

#### Field of application:

- Research & Development

#### Uses:

- Measurements to align the beam and find the optimized collimation

#### Benefits:

- Easy to use
- Extremely short measurement cycle
- Reliable, consistent measurements
- Fast set-up

### Confidence in measurement technology

ALPhANOV is involved in different kinds of projects and performs internal R&D about new or untested optical LMA fibers. One of the main characteristics to be tested is the modal behavior of this kind of fiber. The engineers needed a measurement device delivering reliable and consistent measurements in order to be able to compare each fiber on the same level of quality.

The core parameters that ALPhANOV needs are the beam propagation ratio  $M^2$ , the astigmatism and the beam shape. However, the meter previously used by ALPhANOV delivered results that the developers had little faith in. In addition, the measurement setup used to align the beam could take as long as half a day for custom specifications! This was when ALPhANOV turned to MKS Instruments, and the first demo of the Ophir BeamSquared analysis system demonstrated its advantages in both the repeatability of its measurements and its speed. A decision for the instrument was quickly made, and a few weeks later the BSQ-SP920 was delivered.

**“We were able to install the Ophir BeamSquared system ourselves and have been using it regularly for the alignment of our lasers ever since.”**

**Christophe Pierre, ALPhANOV**

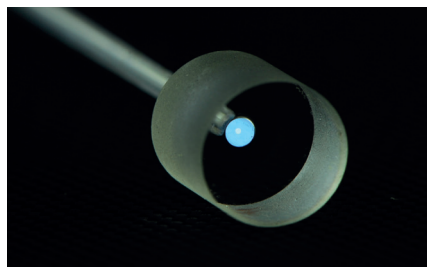


Figure 1: Example of glass processing equipment: Fujikura LZW-125A+

Figure 2 left: Endcap on Rod-Type fiber for High energy laser

Figure 3 right: VLMA Ytterbium doped fiber

### 100 times faster AND more reliable

The BeamSquared system measures the beam propagation in the x- and y-axes, and the supplied software determines ISO-compliant diameter and position of the beam waist, divergence, Rayleigh length, diffraction index  $M^2$  or BPP (beam propagation product), as well as astigmatism and asymmetry of the beam. Depending on the application, the system is offered with different beam profile cameras. ALPhANOV usually works with fiber lasers that have a wavelength of 1  $\mu\text{m}$ , which can be measured with a silicon CCD camera.

The ALPhANOV team was impressed by the speed of the measurements: All the results are available in seconds. Above all, they made sense – and multiple measurements yielded repeatably consistent results.

Christophe Pierre explains: “We were able to install the Ophir BeamSquared system ourselves and have been using it regularly for the alignment of our lasers ever since. This process is so much more efficient now! Instead of several hours, we only need minutes for the alignment, as each measuring procedure takes only seconds and is reliable.” Questions about the use of the software were quickly clarified by Ophir experts.

Additionally, the engineers at ALPhANOV appreciate the flexibility of how to position the system: As BeamSquared can either be used vertically or horizontally it is ideally suited even in spatially confined environments.

**“Instead of several hours, we only need minutes for the alignment, as each measuring procedure takes only seconds and is reliable.”**

**Christophe Pierre, ALPhANOV**

### Reliable measurements boost innovation

Especially when developing integrated laser systems consisting of amplifiers, optics and isolators, the output parameters of the laser beam must be monitored to detect any changes in the beam caustic. In addition, ISO-compliant measurement and documentation of the  $M^2$  value indicates the performance of the laser.

During a national project funded by Bpifrance named 4F-V2, several new kinds of very large LMA fibers have been developed. ALPhANOV tested these fibers and compared their behavior. The BeamSquared systems proofed to be very beneficial within the project as it delivered reliable measurements and laid ground to improve the next generation of fiber. All in all, with the Ophir BeamSquared system, ALPhANOV has gained a considerable increase in quality and significantly optimized their development process.

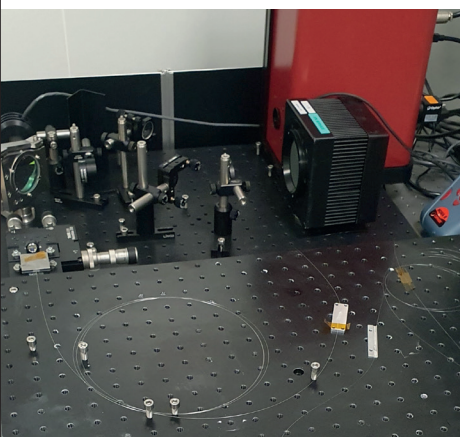


Figure 4: 4F-V2 measurement setup with optics, power-meter and Beamsquared

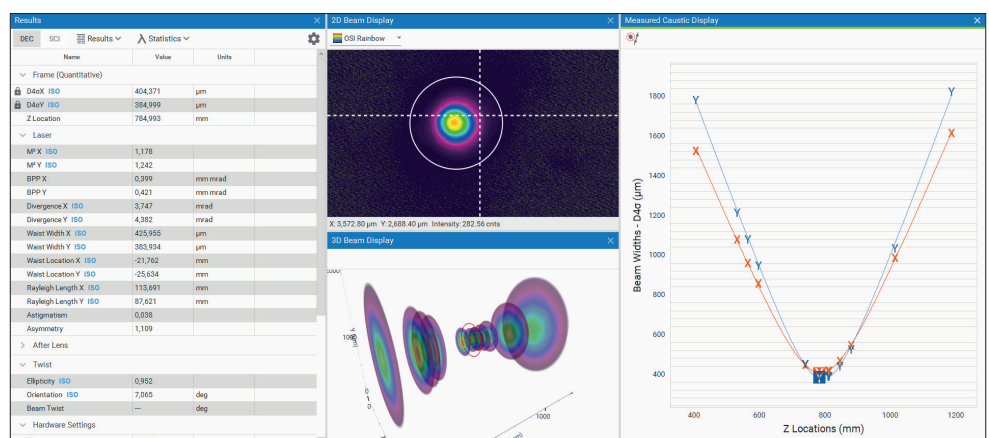


Figure 5: Example of  $M^2$  measurement with Beamsquared for the 4F-V2 ytterbium doped VLMA Fiber



## WHY MKS?

CRITICAL TECHNOLOGIES	PROVEN PARTNER	OPERATIONAL EXCELLENCE	COMPREHENSIVE PORTFOLIO
World-class technology and development capabilities for leading-edge processes	Recognized leader delivering innovative, reliable solutions for our customers' most complex problems	Consistent execution across all aspects of our business	Extensive offering of products and services for the Semiconductor, Advanced Electronics and Specialty Industrial markets.
			

### MKS Photonics Solutions

MKS Instruments helps businesses solve their hardest technology challenges. A trusted partner of the world's largest electronics and industrial companies, we leverage leading-edge science and engineering capabilities to offer solutions that improve process performance and productivity for our customers. Spectra-Physics, Ophir, Newport and ESI are brands within the MKS Instruments Photonics Solutions division. Spectra-Physics combines groundbreaking laser technologies with deep application expertise to deliver industry leading lasers for precision industrial and scientific research applications. Ophir specializes in laser and LED measurement products, including laser power and energy meters and laser beam profilers. Ophir also provides high-performance IR thermal imaging lenses and optical elements as well as optics for CO<sub>2</sub> and high-power fiber laser material processing. Newport provides a full range of solutions including precision motion control, optical tables and vibration isolation systems, photonic instruments, temperature sensing, optical and opto-mechanical components. ESI systems deliver market-leading solutions for Flexible PCB laser processing, high-speed MLCC testing, and CO<sub>2</sub>-laser-based systems HDI PCB and IC substrate manufacturing. MKS Photonics Solutions enhance our customers' capabilities and productivity in the semiconductor, advanced electronics and specialty industrial markets.