Why Azurlight Systems lasers are a perfect fit for atomic physics experiments?

Since the advent of quantum physics in the first half of last century, interaction of light and matter has been an exciting and extensive field of research. In 1997, The Nobel Prize in Physics was awarded jointly to Steven Chu, Claude Cohen-Tannoudji and William D. Phillips "for development of methods to cool and trap atoms with laser light". Since then, there has been an acceleration in theoretical and experimental research and some industrial applications have been already validated.

The lasers used in these experiments must have excellent performance in terms of noise and stability. Stable optical lattices and low temperature optical traps are strongly dependent on laser noise, power stability, mode stability and beam pointing stability. Compromise on one or all of these parameters can lead to unwanted atom heating and loss of or reduction in lattice contrast. Azurlight Systems offers industry leading performance across all of these parameters making the lasers best in class for a wide range of low temperature physics systems.

Laser specifications to consider for atomic physics experiments

Ultra-low noise: Our product development has focused on eliminating all noise sources from our products. This includes dedicated power supplies, air cooling fans, mechanical design and of course optical arrangements. The result is a range of ultra-low noise devices (RIN < 0.05% RMS) that are continuously improved.

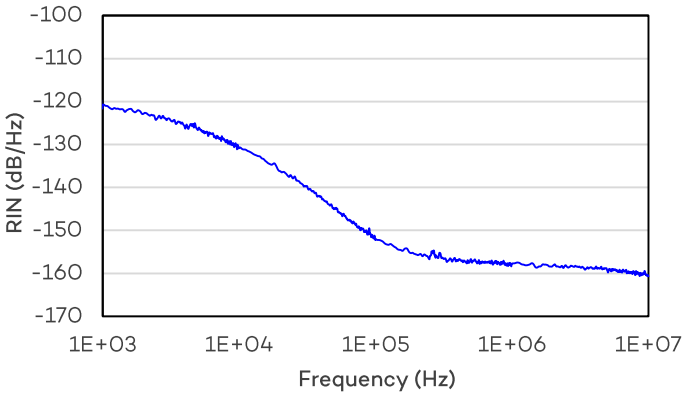

Fig. 1: Typical RIN measurement for a 50 W 1064 nm laser

Wavelength range and stability: Because researchers are cooling a large variety of atoms, we offer a wide range of standard wavelengths in the IR (976 nm, 1030 nm & 1064 nm) and their visible counterparts (488 nm, 515 nm & 532 nm). Other wavelengths in the 1010-1120 nm range and their second harmonic are available on request. Again, the design of these products results in very good wavelength stability and very low sensitivity to environmental conditions.

Output power: Azurlight Systems focuses on high power fiber lasers and offers the highest performance at these powers. Up to 130 W in the IR and up to 10W in the visible are available with no compromise on specifications.

Linewidth and OSNR: All our sources are available with narrow spectral linewidth (Δλ < 50 kHz for IR and Δλ < 200 kHz for visible) for long coherence length applications and this optical spectrum is very "clean" (> 50 dB OSNR in the IR and > 100 dB OSNR in the visible).

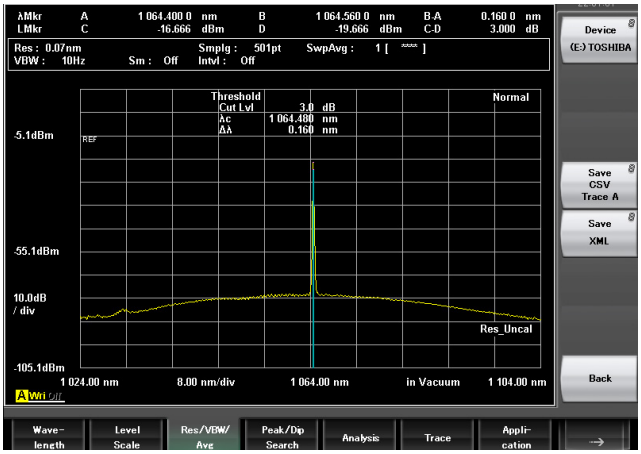

Fig. 2: Typical optical spectrum for a 50 W 1064 nm

Azurlight Systems
Cité de la Photonique
11 avenue de Canteranne
33600 Pessac, France

Tel. +33 (0) 5 47 74 55 90
Fax. +33 (0) 5 47 74 55 99
Mail. contact@azurlight-systems.com
www. azurlight-systems.com

Output power and beam pointing stability: Other crucial specifications when dealing with cold atoms are the beam pointing and output power stability. The cooler-less design of our optical heads enables output power stability of less than ± 0.5 % and beam pointing stability better than ± 0.5 µrad/°C.

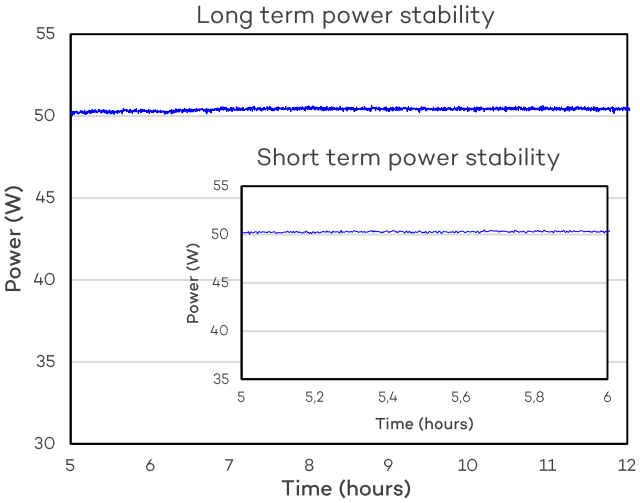

Fig. 3: Typical power stability measurement for a 50 W 1064 nm laser. Our lasers are all equipped with high grade output isolation (45 W after isolation)

Beam quality and polarization: Our MOPA (Master Oscillator Power Amplifier) based optical designs confines light in single mode fibers all along the path. This brings a lot of advantages in terms of compactness, efficiency, and reliability. Also, the beam quality is excellent (M^2<1.1) and linear polarization well above 20 dB and extremely stable over time. High specification polarization dependent optical isolators are integrated as standard, further enhancing output polarization and stability (PER typically > 25 dB).

High power system: Azurlight Systems now offers 130 W of output power. Our 130 W product line offers an unmatched power with this features beam quality (M^2 < 1.2) out of a water-cooled compact laser head. Different turn-key configurations are available : either lasers or amplifiers. Great power stability is made possible by a careful and robust integration of our optical components. The Constant Power mode of operation and its feedback loop gives the best power stability performances (< ± 0.5%).

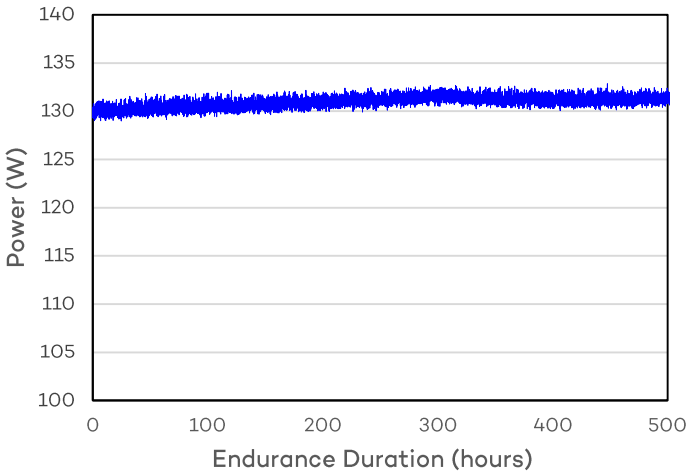

Fig. 4: Typical power stability measurement for a 130 W 1064 nm laser.

About Azurlight Systems: Azurlight Systems offers the highest power and lowest noise on the market for single frequency fiber lasers and high-power PM fiber amplifiers, with dozens of systems installed in major quantum optics centres around the world. The company has developed a deep understanding of noise properties of optical fiber amplifiers, leading to a fundamental redesign of product architecture to produce high power systems (130 W) approaching shot noise performances.

Azurlight Systems possesses state of the art research, development and production facilities at its headquarters in Pessac. Dedicated metrology systems have been developed to characterize and maintain performances at high powers down to extreme low noise detection limits (- 165 dB/Hz). The company has access to various next generation fiber products through different collaborations. The company participates in a key research facility at the University of Bordeaux (http://www.lp2n. fr/starlightplus/) with 5 full time staff, and access to the state-of-the-art fiber component and architecture plat- form at the Alphanov technology centre.

Fig. 4: An Azurlight Systems 50W 1064 nm laser.

Azurlight Systems
Cité de la Photonique
11 avenue de Canteranne
33600 Pessac, France

Tel. +33 (0) 5 47 74 55 90
Fax. +33 (0) 5 47 74 55 99
Mail. contact@azurlight-systems.com
www. azurlight-systems.com