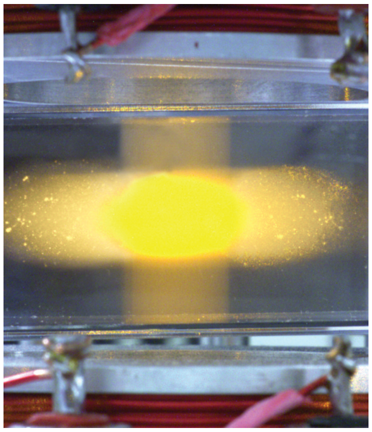
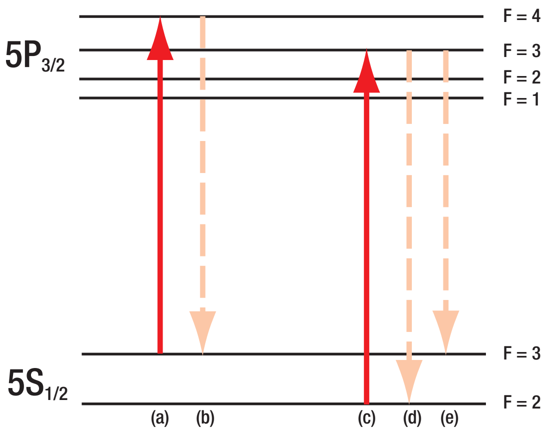
Integrated Systems



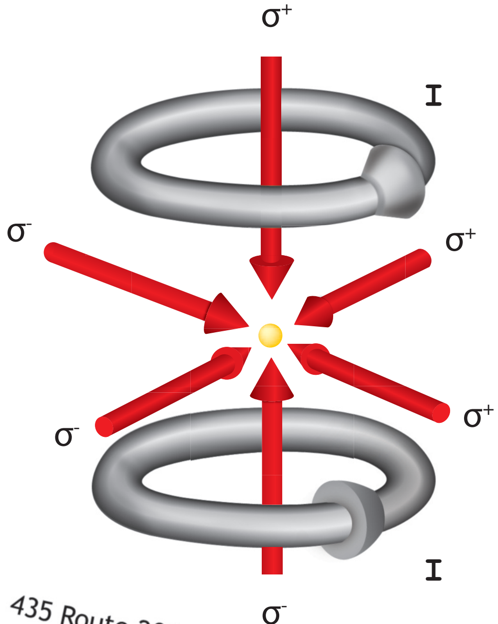
Fluorescence of Rb atoms in the MOT cell, as detected by a CCD camera.

Magneto-Optical Trap



Magneto-optical traps (MOTs) use a combination of lasers and magnetic fields to localize and cool neutral atoms to temperatures in the micro Kelvin regime. MOTs are essential for ultra-cold atoms research and have enabled extensive studies of Bose Einstein Condensates and Degenerate Fermi Gases.

To operate a MOT, two lasers need to be frequency locked such that they are slightly detuned to the red of the atomic transitions and stabilized to less than the 5 MHz natural transition linewidth. Locking offset from the actual transitions is easily achieved with the Thorlabs DAVS stabilized tunable laser featured on the back side of this sales sheet.



The diagram to the left shows six beams of which three are right circularly polarized (σ^+) and three are left circularly polarized (σ^-). These six beams are necessary to provide confinement and cooling in three dimensions. For successful operation, two lasers have to be stabilized close to the Rubidium D2 transitions. One laser, often referred to as the "trap laser" and represented by (a) and (b) in the energy level diagram above, provides the trapping forces. The second laser, known as the "re-pump laser" and represented by (c), (d), and (e) in the above diagram, ensures that the Rubidium atoms do not accumulate in the F=2 ground state, which cannot be accessed by the trap laser.

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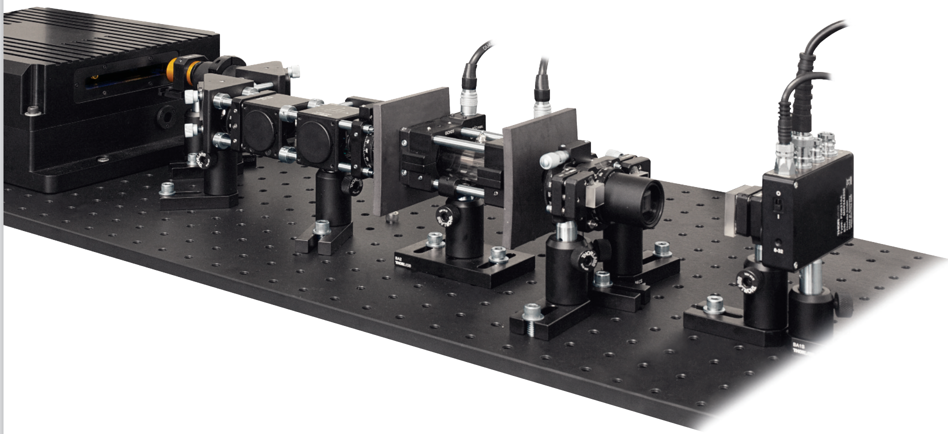
Call for pricing

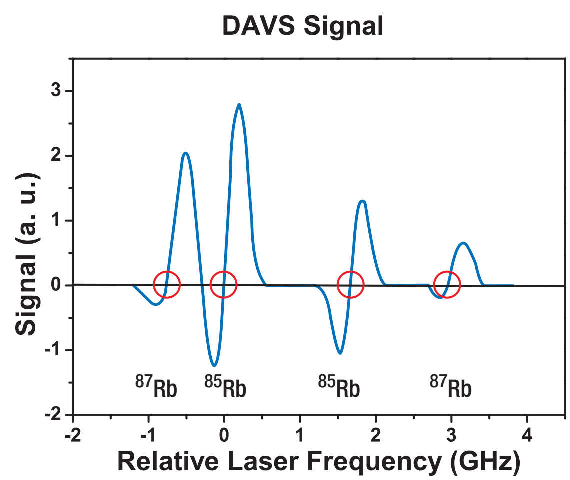


Features

- Laser Stabilized to Rubidium Transitions for Atom Cooling and Atomic Physics Applications
- 40 mW Output Power
- Instantaneous Linewidth <100 kHz, Long Term Stability <2 MHz
- ~500 MHz Wide Capture Range

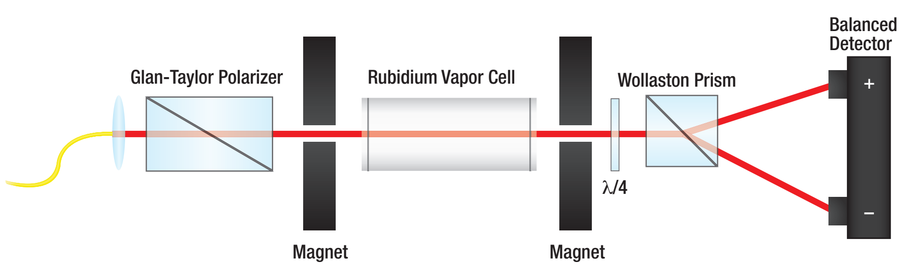
Frequency-Stabilized Laser

Thorlabs' frequency-stabilized laser kit extends our line of tunable diode lasers by providing an option for stabilizing the laser output to an atomic transition frequency. This light source is suitable for cooling and trapping of Rubidium atoms, as well as other atomic physics applications. The kit employs Dichroic Atomic Vapor Spectroscopy (DAVS) to stabilize the frequency of a Thorlabs tunable diode laser to less than 2 MHz RMS long term. The DAVS technique allows for a large capture range of ~500 MHz, making the system resilient to external perturbations. Furthermore, the laser can be locked so that it is detuned from the line center frequency.



The laser can be locked to any of the circled zero crossings.

Dichroic Atomic Vapor Spectroscopy



The Rubidium vapor cell is placed in a weak longitudinal magnetic field, followed by a retarder and a polarizing beamsplitter (Wollaston prism). The absorption profiles of the two circular components (σ^+ and σ^-) that comprise the linearly polarized input beam are shifted to higher and lower frequencies, respectively. The dispersion-like DAVS curve (as seen above) is generated from the difference between the two signals, which provides an error signal for the lock.

For more information or to place an order, contact one of our Customer Support Specialists at 973-300-3000 or visit www.thorlabs.com.

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