

Frequency-controlled laser systems dedicated to atom cooling and trapping

Muquans proposes a new generation of agile laser systems offering a **precise control of the laser absolute frequency and fast tunability**. A wide variety of configurations can be proposed:

- up to 4 independent frequency-stabilized laser heads operating at 780.23 nm
- tunability frequency range up to 1 GHz
- sideband generation
- fast beam extinction and power modulation
- phase-locking of laser outputs
- Power splitting : 1 → 3 or 1 → 6 output fibers per laser head, with independent power control.

The laser architecture is based on the utilization of slave lasers, frequency-locked to a master laser whose frequency is stabilized on an atomic transition using saturated absorption spectroscopy. Our laser systems are equipped with dedicated electronics that offer:

- ultra-low noise
- excellent robustness (continuous **frequency locking demonstrated over several weeks**)
- user-friendly operation (**automatic frequency locking**).

These laser systems can be equipped with an ultra-low noise microwave synthesizer, upon request.



High reliability, fibered laser technology

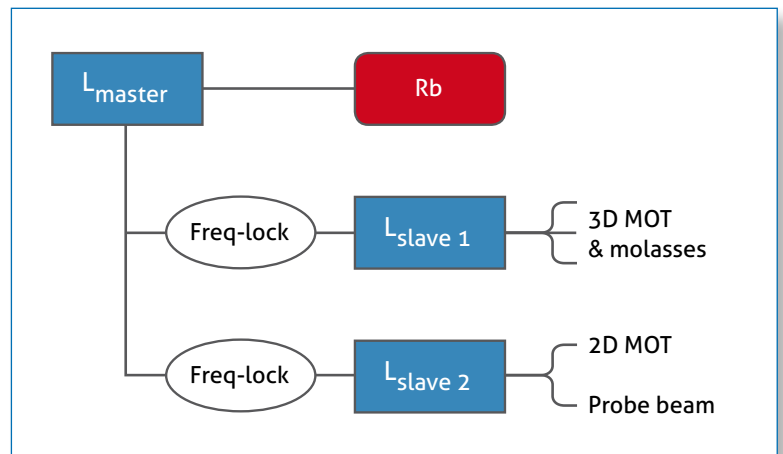
The laser system developed by Muquans is based on 1560 nm seed lasers, which are then frequency-doubled to generate the required wavelength of 780 nm. This approach gives access to a wide variety of high performance fibered optical components, originally developed for high-bit-rate optical communications systems. Thanks to the technological effort conducted over the last 20 years by the telecom industry, these components present unique features:

- fibered components: no optical alignment required
- extreme optical and electrical performances
- compliance with Telcordia qualification procedures (extended temperature range)
- high reliability.

Example of configuration

We present here one example of configuration developed for a Bose-Einstein Condensation experiment comprising:

- one laser head with tunable cooling frequency and repumping frequency dedicated to:
 - ▶ the operation of a 2D MOT
 - ▶ one probe beam
- one laser head with tunable cooling frequency and repumping frequency, with 3 output fibers for the implementation of a 3D MOT and optical molasses.



Example of laser architecture developed for a Bose-Einstein Condensation experiment

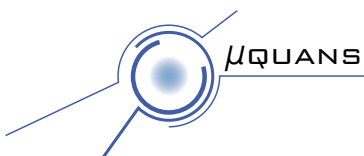
Specifications

► Optical characteristics

Operating wavelength	780.23 nm (D2 line of ^{87}Rb and ^{85}Rb)
Output power	> 300 mW per laser head (direct use for atom manipulation)
Power stability	1% rms over 1 hour
Linewidth	< 200 kHz FWHM
Tunability range	up to 1 GHz
Sweeping rate	> 250 MHz/ms typ.
Polarization	Linear, PER > 20 dB
Beam quality	TEM_{00} , $M^2 < 1.1$
Rise/fall time	< 1 μs

► General characteristics

Dimensions	19" rack, 500 mm depth, from 6 to 14 U, depending on the laser configuration
Supply voltage	100-240 VAC, 50-60 Hz
Electrical power consumption	< 250 W typical, depending on the laser configuration
Air-cooling	



Contact

Should you have any inquiry regarding our products or our technologies, please feel free to contact us.

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