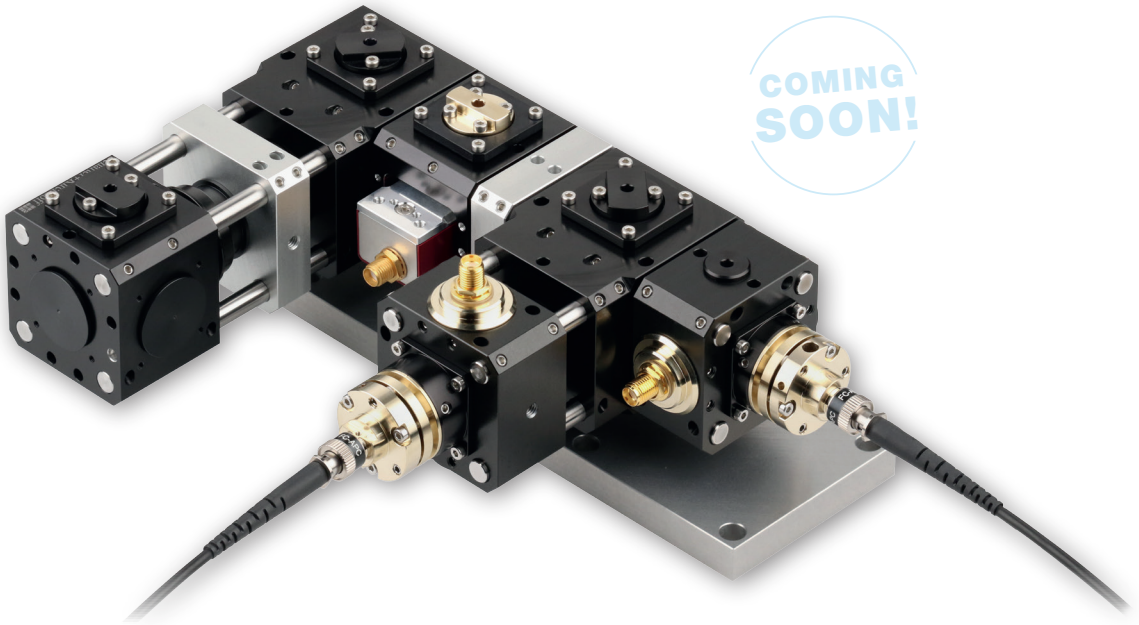
Double-Pass Acousto-Optic Modulator (AOM)

All fiber-coupled, polarization-maintaining acousto-optic modulator setup for tunable frequency shifting and laser light intensity modulation.



With the rise of quantum computing, the field of ultracold atomic and ion systems aims to move from laboratory experiments to robust applications suitable for different environments. This places higher demands on the thermal stability of the opto-mechanical units used to control, modulate and distribute laser light for these applications.

Double-pass acousto-optic modulator (AOM) systems are a versatile tool for frequency control and intensity modulation of laser light. Thus, they are widely used in quantum optics, including quantum gas preparation and spectroscopy.

Schäfter+Kirchhoff provides a broadly tunable double-pass AOM system integrated into fiber port clusters, the rugged, modular and compact multicube™ series. A scheme of a prototype for a laser wavelength of 561 nm and a center radio-frequency of 80 MHz (MT-80-B30A1-VIS, AA Opto-Electronic) is shown in Fig.1 (all values and data are preliminary).

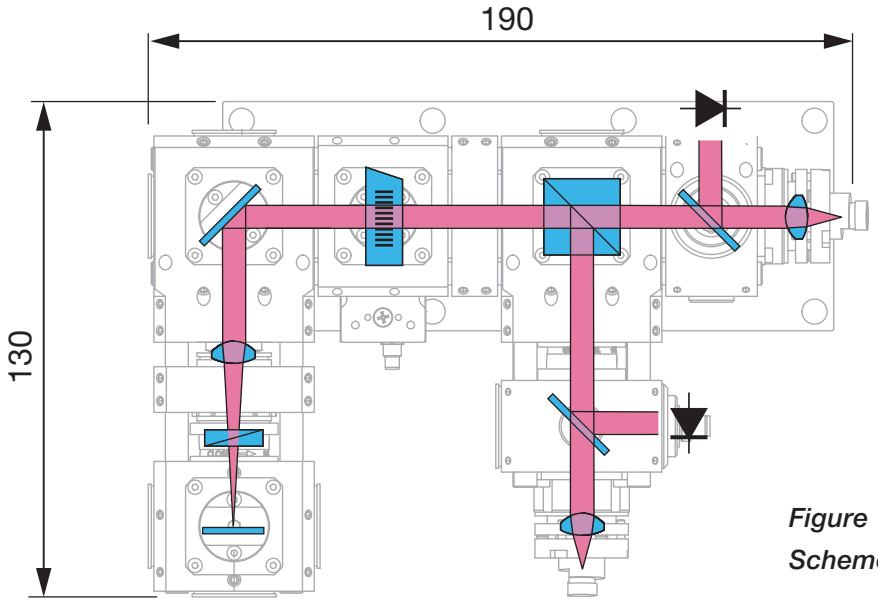


Figure 1:
Scheme and dimensions

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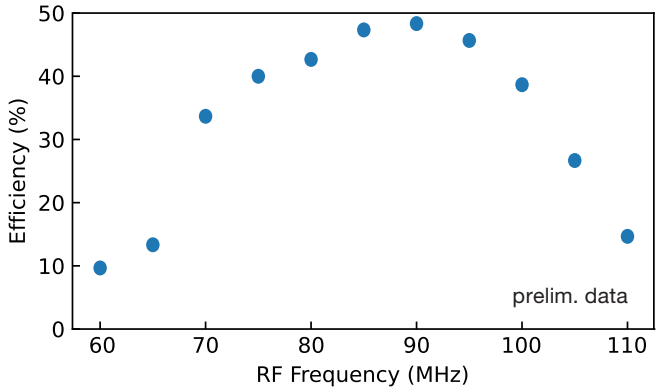

Figure 2:

Tunability Measurement. Double-pass AOM efficiency P_{out}/P_{in} for different RF frequencies measured behind the output fiber.

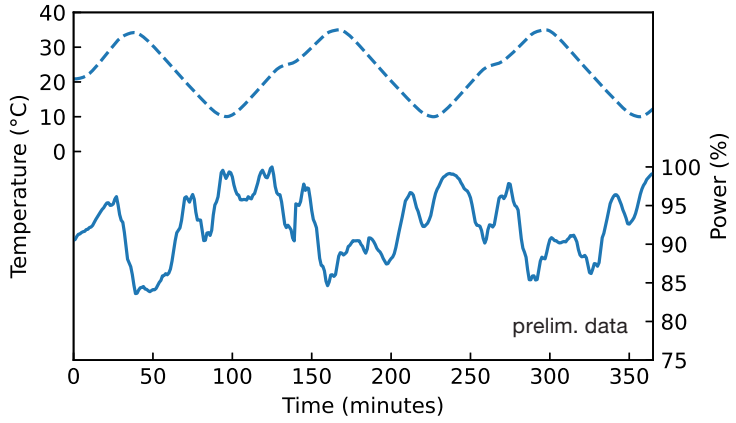

Figure 3:

Thermal stability stress test. The ambient temperature is varied between 10 °C and 35 °C in a climate chamber with a cycle time of roughly 130 minutes (dashed line). Measured relative output power of the fiber-coupled double-pass AOM as a function of the cycling time (solid line).

The modular muticube™ system of Schäfter+Kirchhoff allows for integration of a variety of acousto-optical modulator setups including various laser wavelengths and RF frequency ranges. Entire fiber port clusters with integrated modulators can be built. In addition, these setups can be combined with monitor diodes, shutters, beam splitters and other established multicube™ components.

Contact

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