# Fiber-based pulsed laser ablation setup for the release of neutral atoms within an ultra-high vacuum chamber

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In advancing quantum computing technologies – and specifically ion trap based quantum processors – scaling, modularity and increased qubit quality are among the many crucial challenges. These need to be overcome in order to reach the critical amount of qubits necessary to fully unlock the quantum computing potential. We aim to tackle some of these challenges by developing a modular and miniaturized atom source that can feed neutral atoms into a microfabricated ion trap, via pulsed laser ablation and a fiber-based beam delivery. A crucial part of this project is the development of a laser ablation setup, not relying on conventional free beam optics components, but based on modular fiber optics. The design allows the delivery of light pulses within an ultra-high vacuum environment with pulse energies in the µJ range and a repetition rate from single shots to few kHz, while maintaining a spot size in the µm range. Initial atom source tests will be conducted with a quadrupole mass spectrometer, to analyze the ablation plume for various target materials.

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