

Shielding of ultracold Lithium-6

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We present the Heidelberg Quantum Architecture, a modular quantum gas platform, combining individual modules to implement a wide variety of functionalities that can be rapidly updated and exchanged [1]. We use this experimental platform to create a degenerate Fermi gas of ${}^6\text{Li}$.

Here, we report on the implementation of an optical dipole trap module at 812 nm near the 2p and 3s resonance. While the imaging transition used in our system is the D₂ line of ${}^6\text{Li}$ at 671 nm between the 2s and 2p fine structure levels, the 812 nm trap introduces a large differential light shift as the 2p level has a diverging polarisability at this wavelength, effectively detuning the imaging transition from the imaging laser. This allows for site-selective shielding of the atoms and thus enables partial probing of the system.

One of these dipole traps is created using a spatial light modulator (SLM) module, realising precise and reproducible light fields with flexible geometry. This includes the ability to correct for optical aberrations and in-shot dynamics, for example repositioning of the atoms in a shielded tweezer.

In this talk, we address these topics, present the optical modules used to generate the required light fields, and show the first data on shielding a motional ground state of a fermionic many-body system in an optical tweezer.

[1] T. Hammel *et al.*, *Phys. Rev. A* **111**, 033314 (2025).

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