7th European Conference on Trapped Ions

Contribution ID: **178** Type: **Poster**

Trapped ion quantum engineering platforms

Monday, 25 September 2023 19:30 (2 hours)

Ion trap experiments have evolved drastically over the last decades. The surge in quantum computing, communication and metrology projects led to an increased demand for more advanced ion traps and control systems.

We established a rapid prototyping facility at University of Mainz to meet the fabrication requirements of highly advanced three-dimensional ion traps, like 3D glass structuring, precise alignment of structures, metal coating and eventually the integration of micro-optical components.

We will present a two-layer segmented linear ion trap, fabricated in this facility with selective laser-induced etching of 4-inch fused silica wafers followed by PVD gold-coating, wafer dicing and sub µm-precision die bonding. Upgrades will be made in the coming months to allow for electroplating, laser polishing and UHV compatible assembly of micro-optical components.

We are also building up 9 experiments for testing and operation of such ion traps, which feature titanium vacuum vessels intended for XHV pressures, high-performance mu-metal shielding, high NA optics for individual addressing of ions in linear crystals. All experiments will be equipped with custom rackmount multi-AWG electronics for ion register reconfiguration and Raman gate operations, laser systems and compact optical components.

We will present our newly developed experimental control system in more detail. The system is scalable to a large number of qubits, performs all real-time and near-real-time operations and features self-calibration and auto-alignment procedures. With this system we aim for a simple and reliable 24/7 user access for our quantum computing experiments.

Primary author: LEKITSCH, Bjoern

Presenter: LEKITSCH, Bjoern

Session Classification: Monday Poster