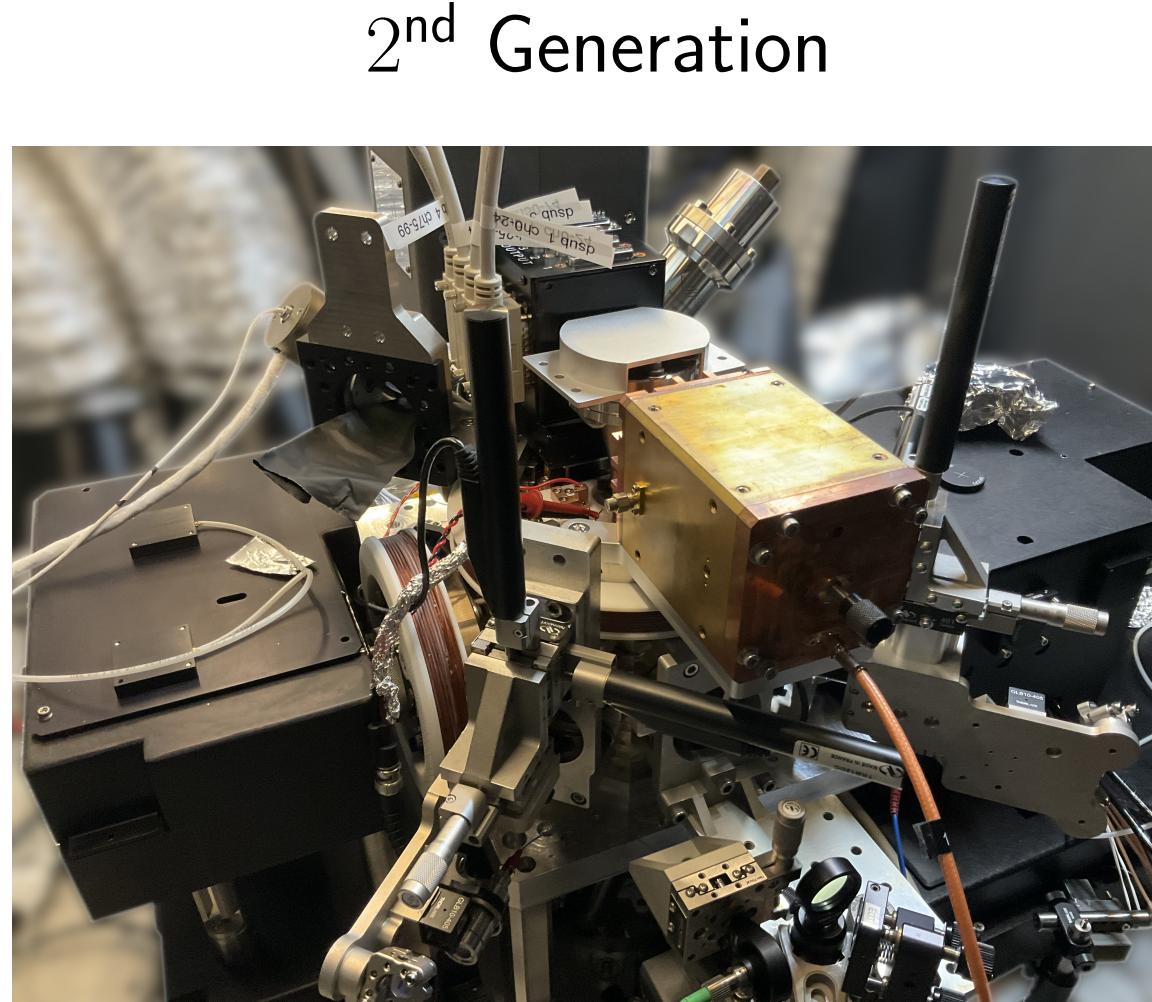


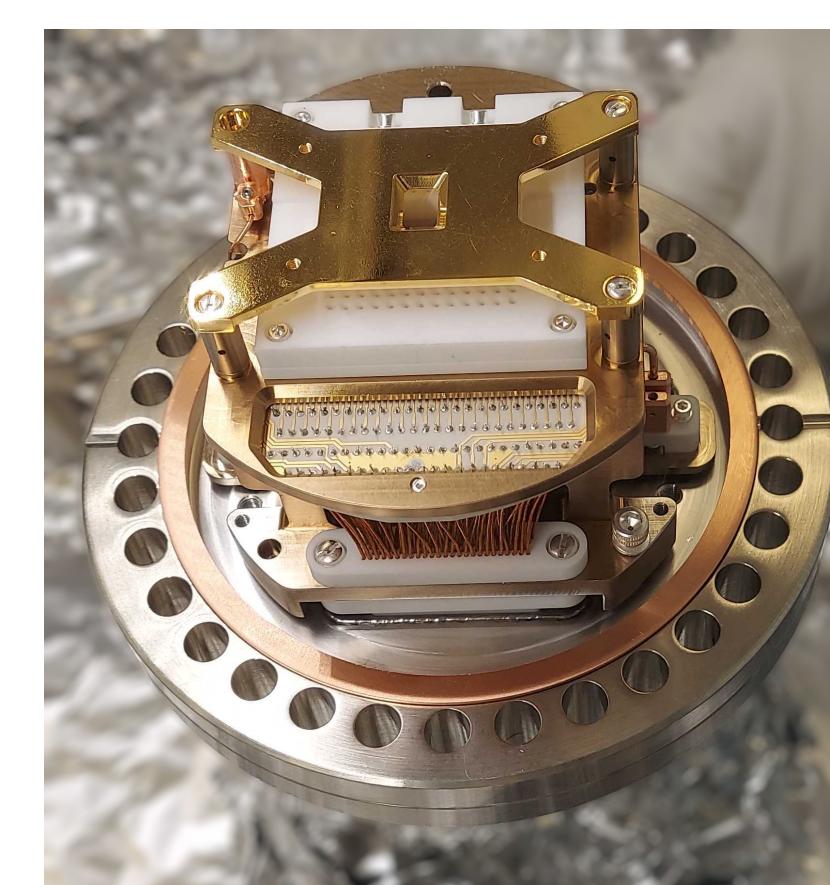
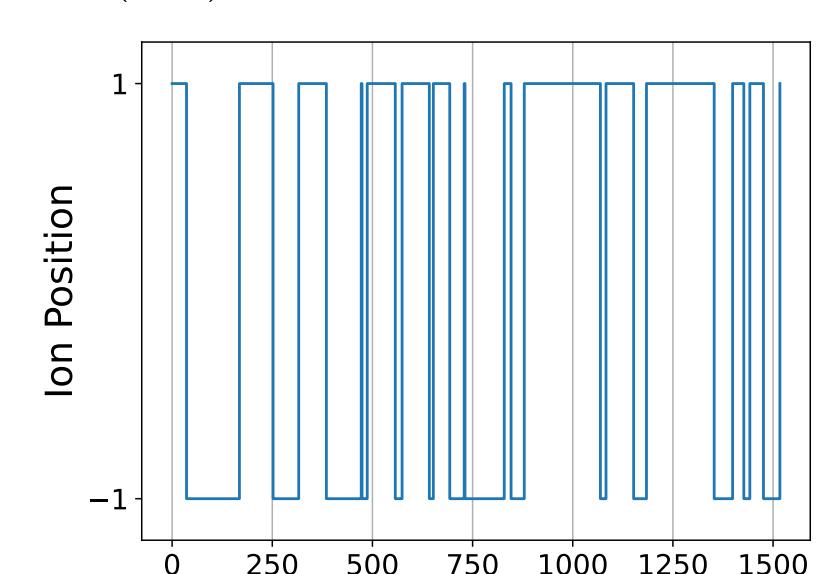
Error-corrected Universal Reconfigurable Ion-trap Quantum Archetype

- 1st Generation
- 15–24 usable qubits
- High fidelity single (99.9 %) and two-qubit (99 %) gates
- Universal reconfigurable
- Remote operations



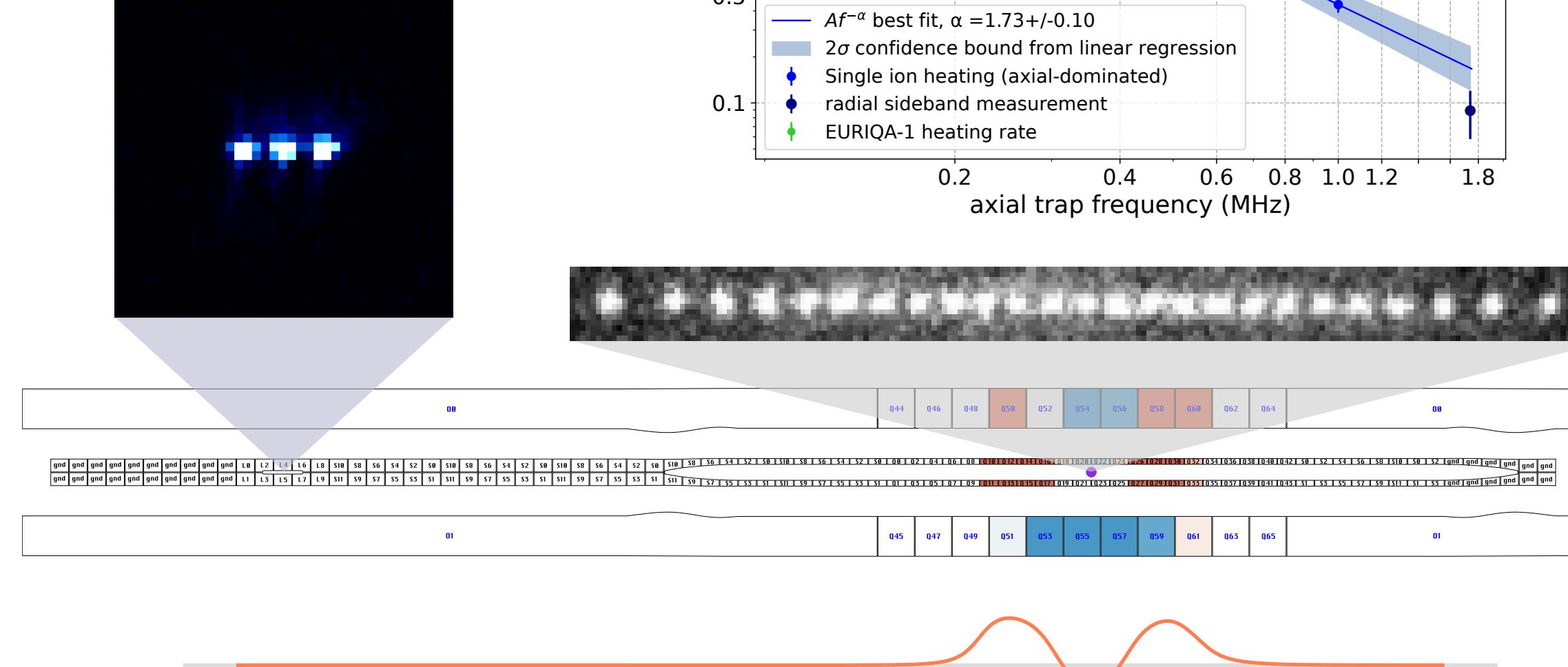
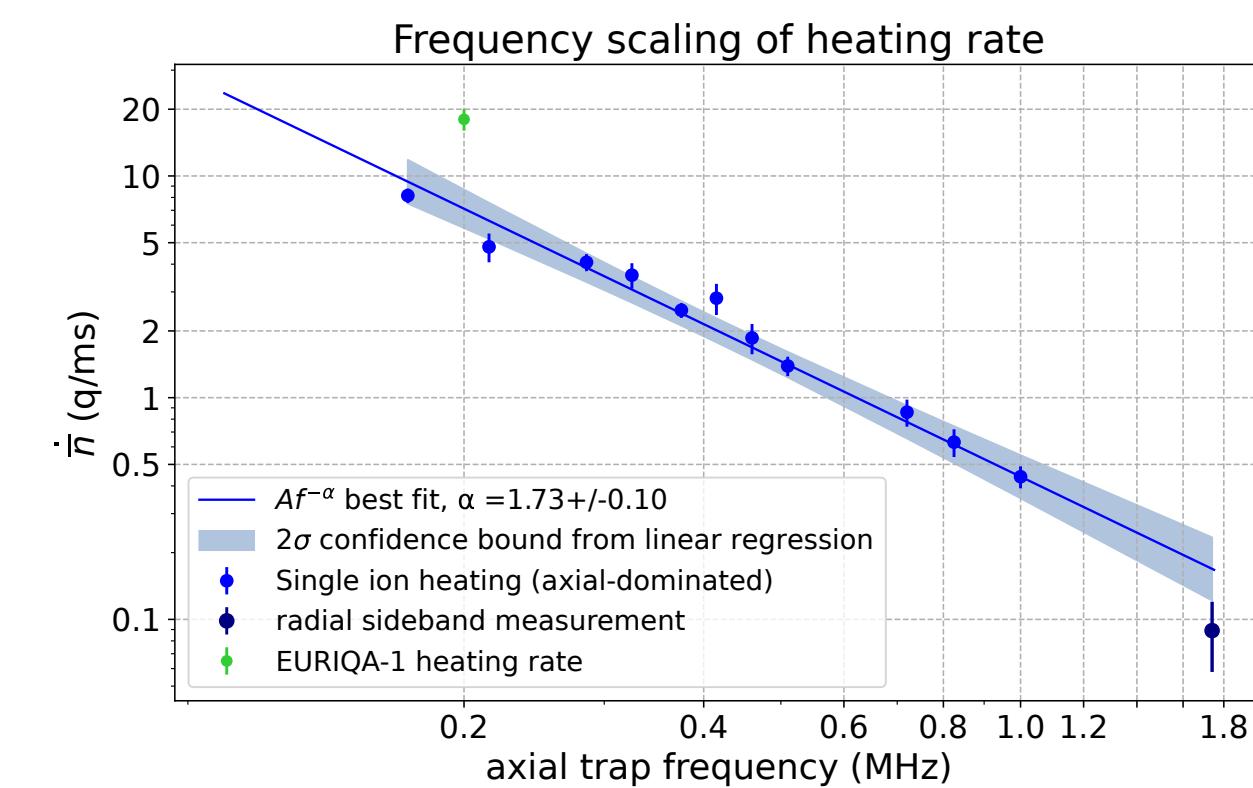
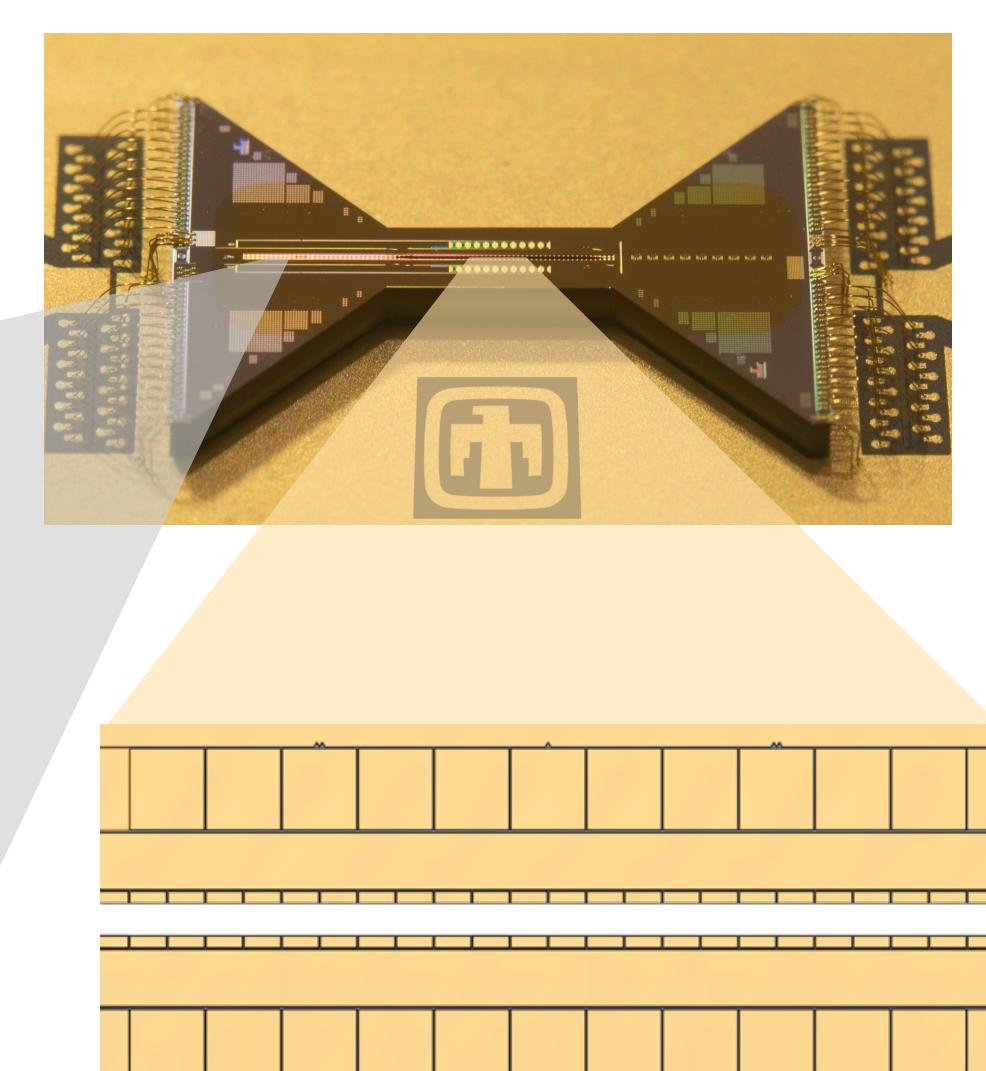
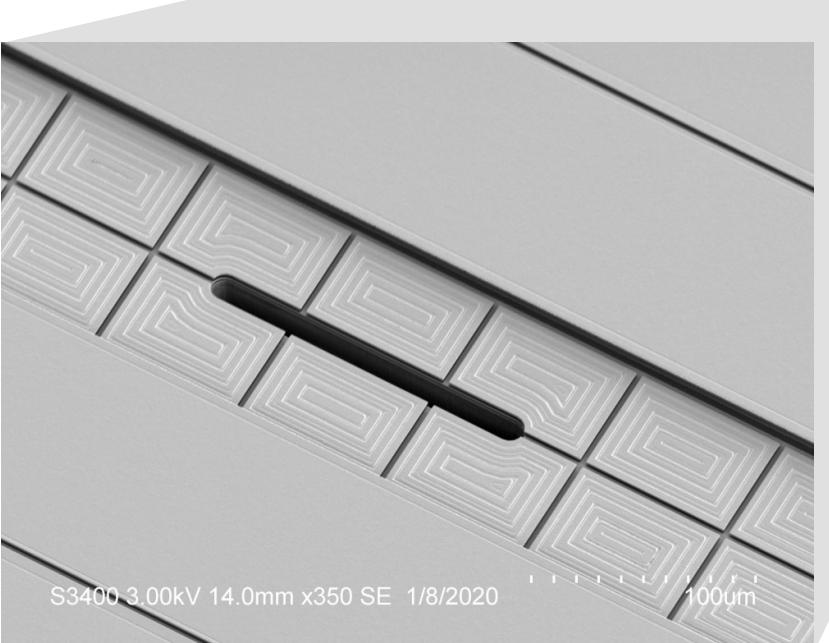
Vacuum System

- Vacuum fired components
- Reduce ion-chain reordering rate
- $1.32(21) \times 10^{-11}$ Torr measured

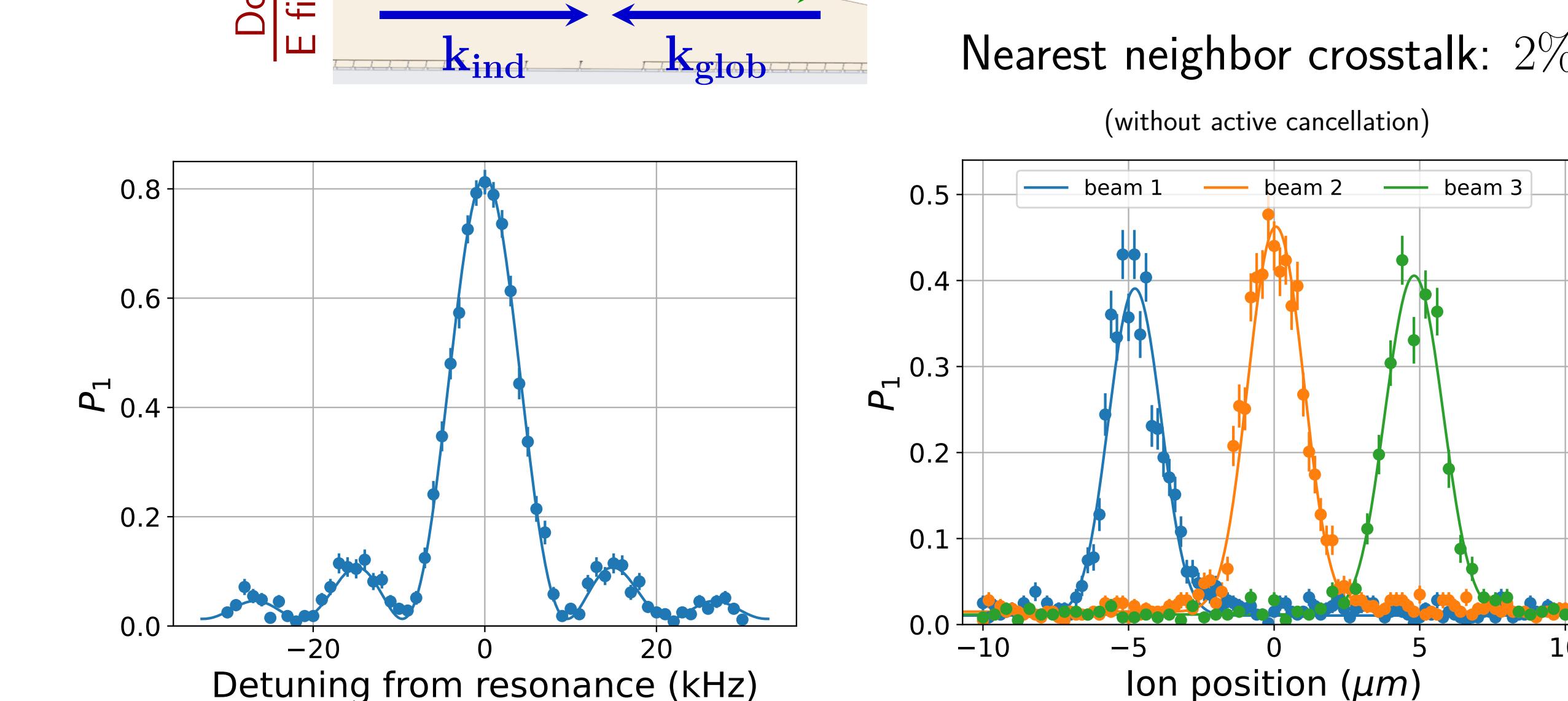
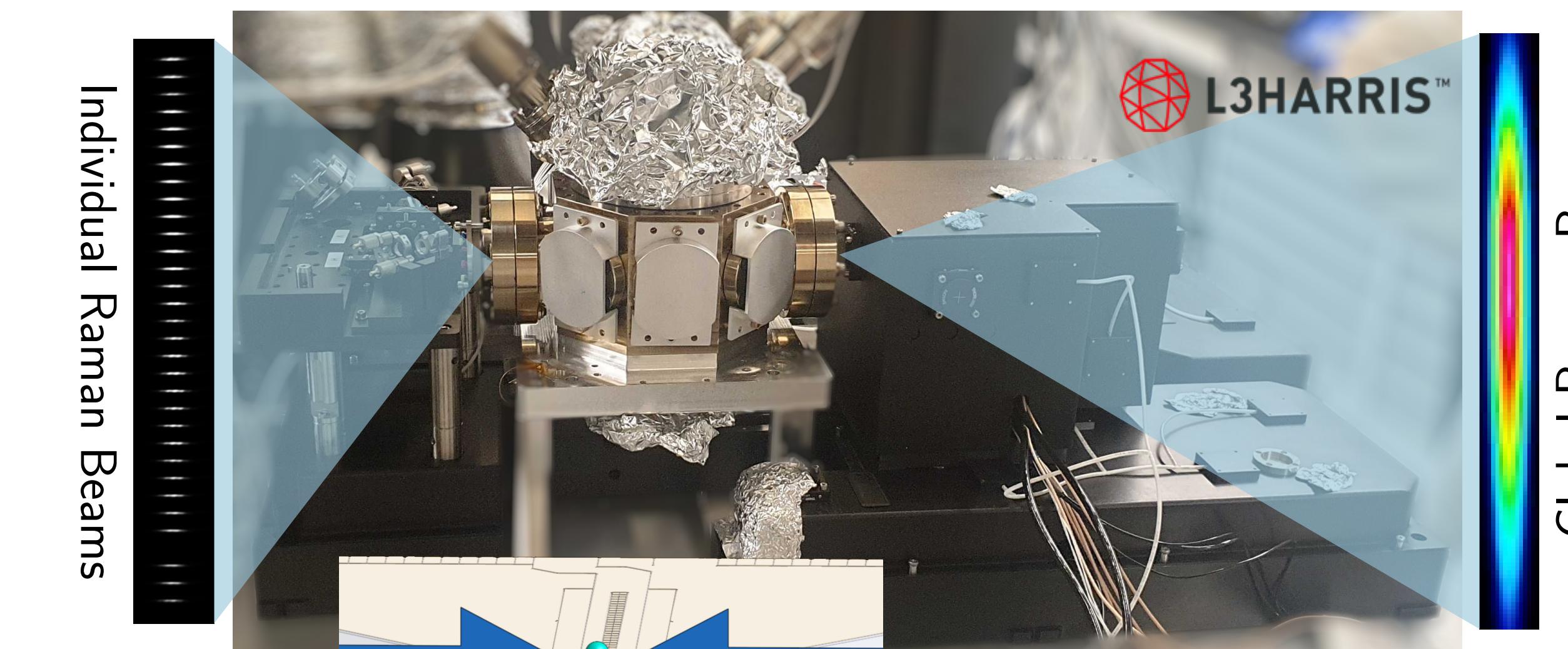


Phoenix Surface Trap

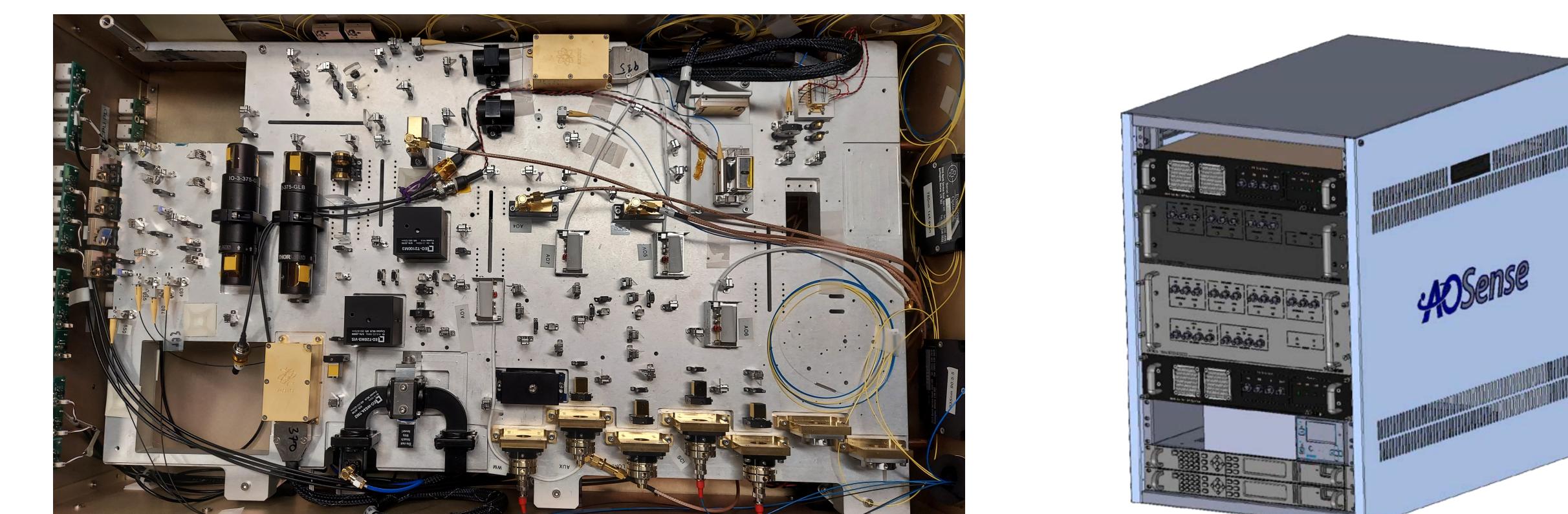
- Segmented outer electrodes
- Better and faster ion loading
- Better metallization
 - Reducing noise
 - 3x less heating compared to EURIQ-A-1



Raman System



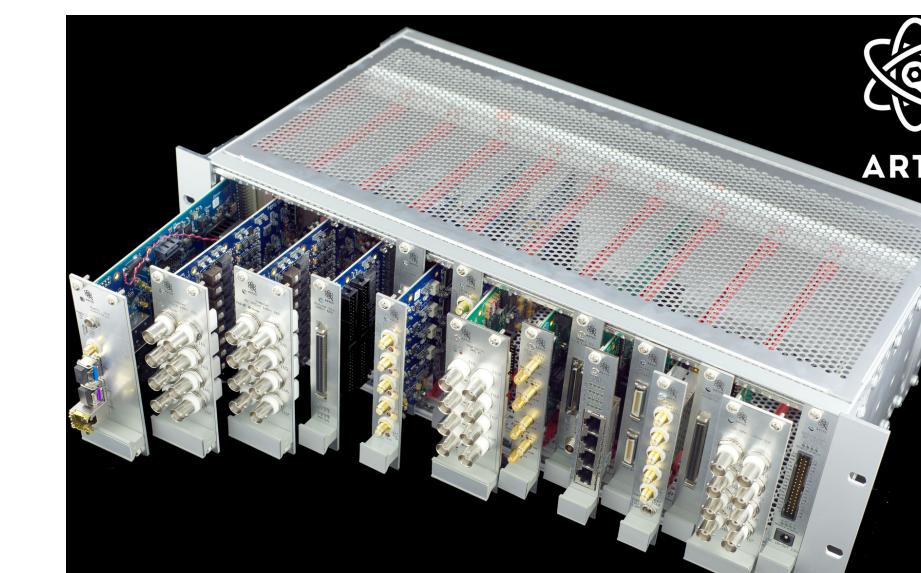
Miniaturized 369/399/780/935nm Beam Path



Control System

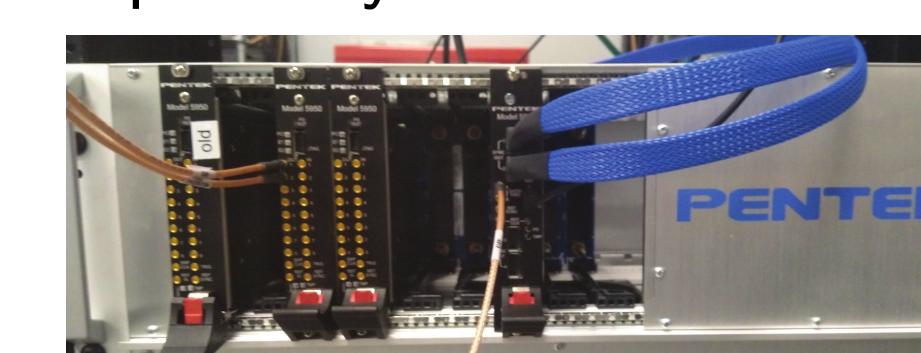
ARTIQ

- Artiq software
- Sinara hardware



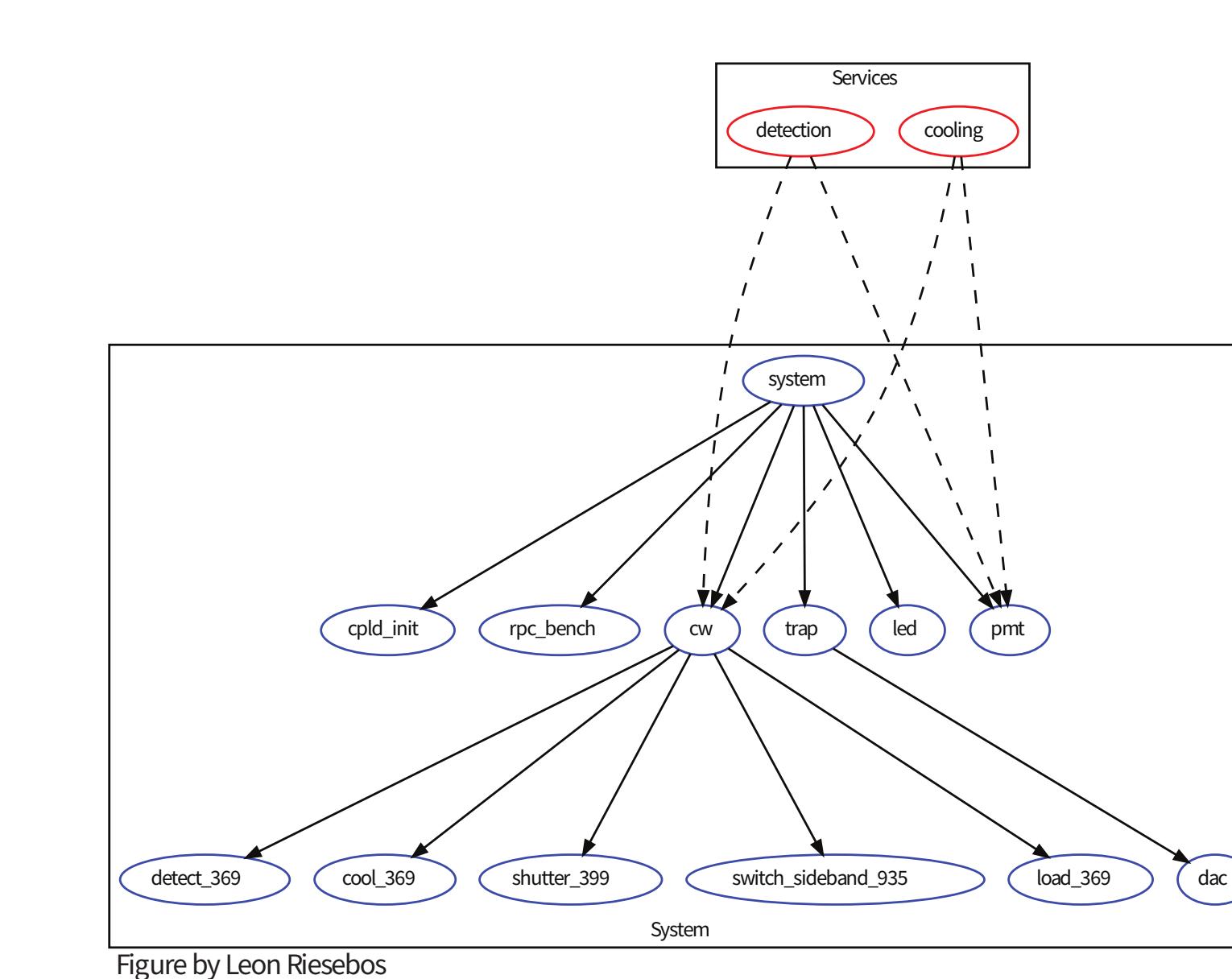
RFSoC/Pentek

- integrated pulse-level control
- phase synchronization



Duke Artiq Extensions

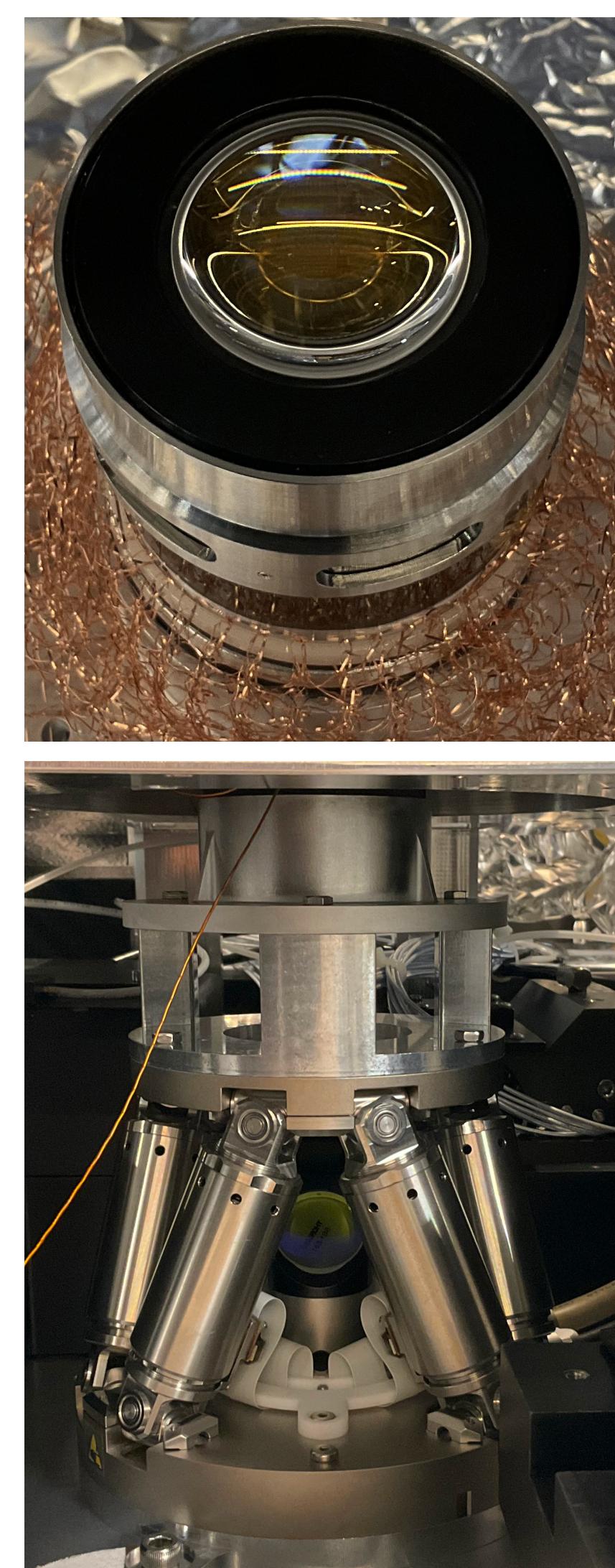
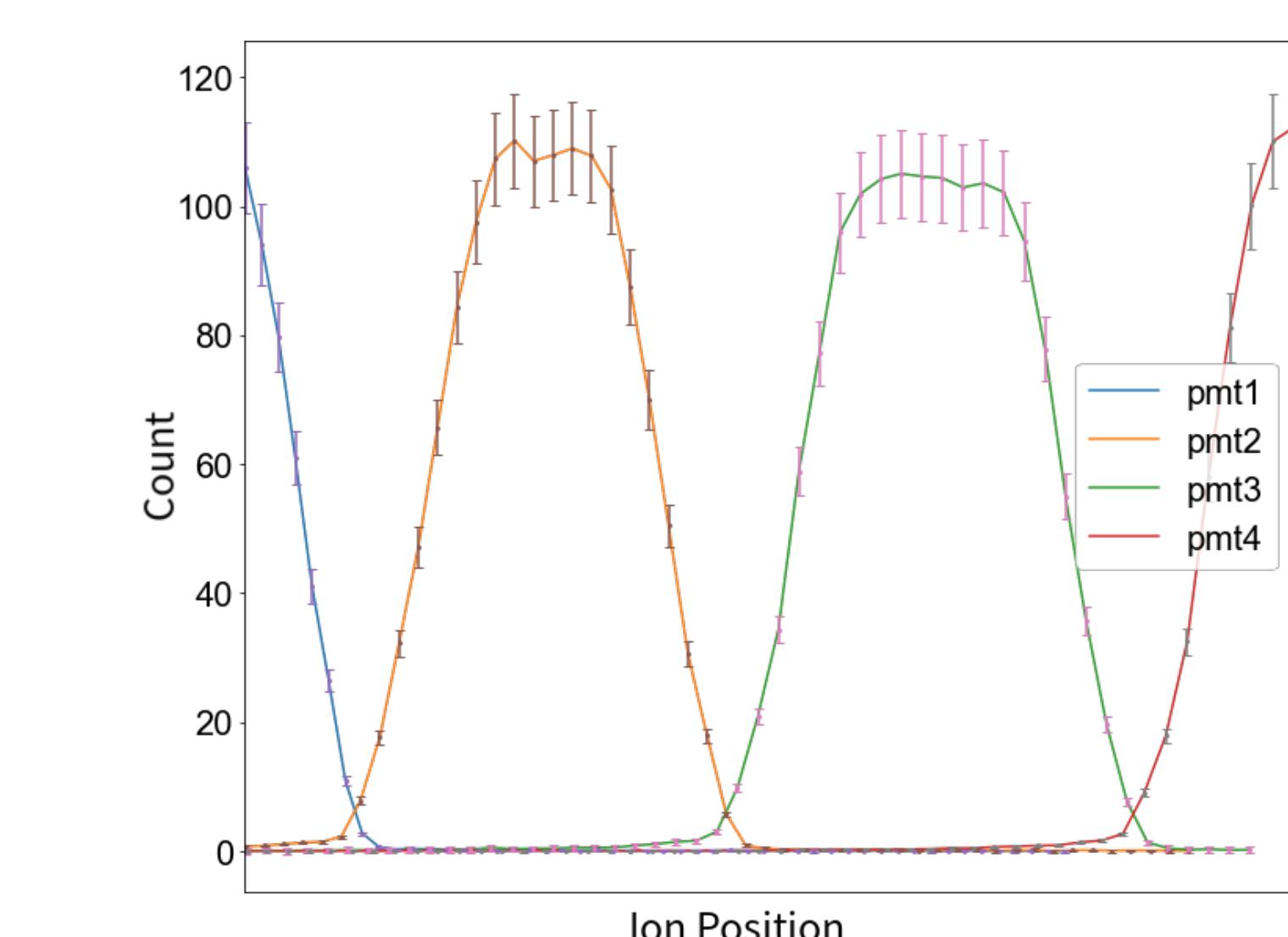
- modular control software
- system code organization



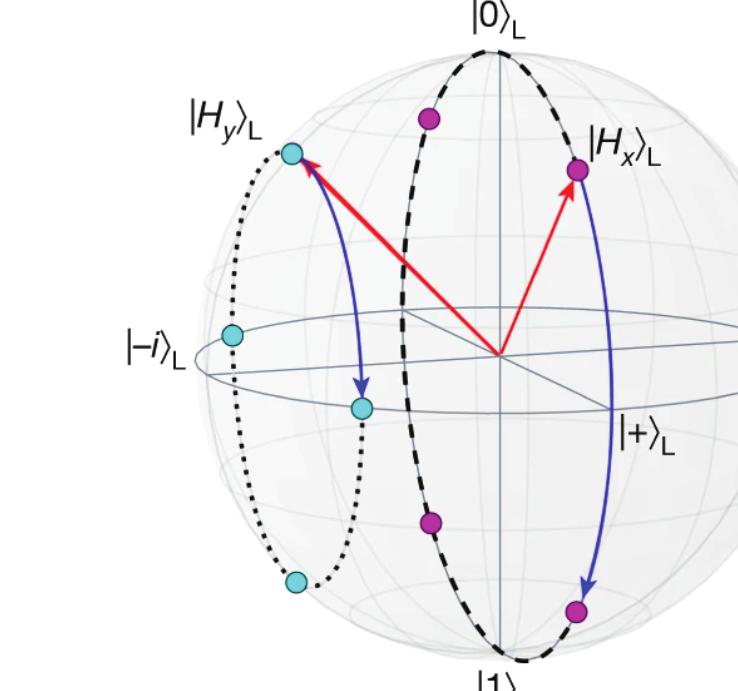
Imaging System



- Imaging system for 32 ions
- Two stage imaging system with a total magnification of 27
- Minimized instrumental crosstalk by coupling fluorescence from each ion to the individual PMT module (Hamamatsu, H10682-210)
- PhotonGear optical lens design (0.63 NA) mounted on PI Hexapod for precise positioning
- Measured crosstalk between neighboring channels: 0.05%



Applications



- Universal Quantum Computer
- 20+ qubits and high fidelity
- Quantum simulations of many body physics
- Quantum chemistry
- Quantum gravity
- Nuclear theory
- Quantum Error Correction

