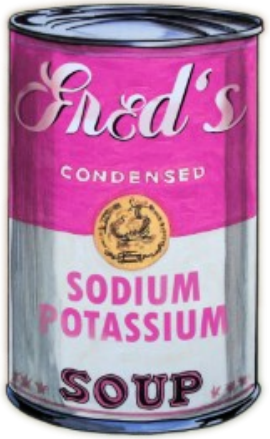
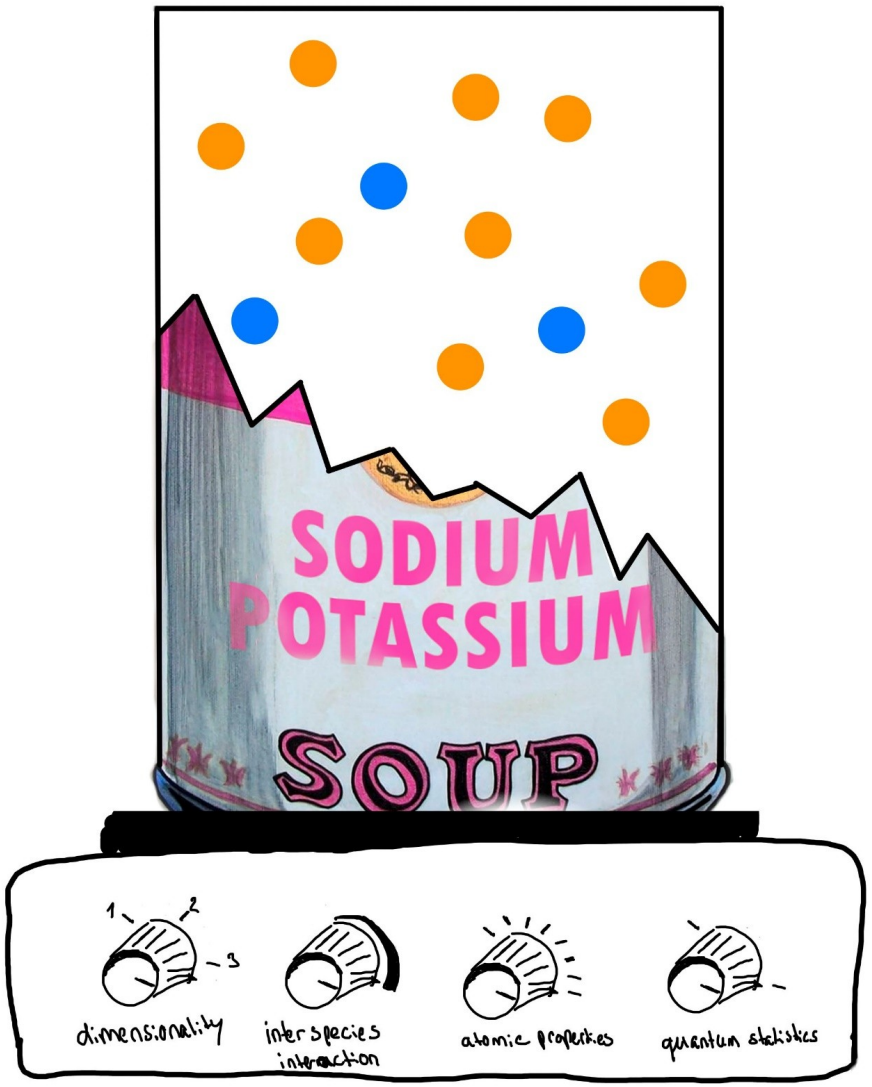
Mixing a sodium potassium soup – served cold

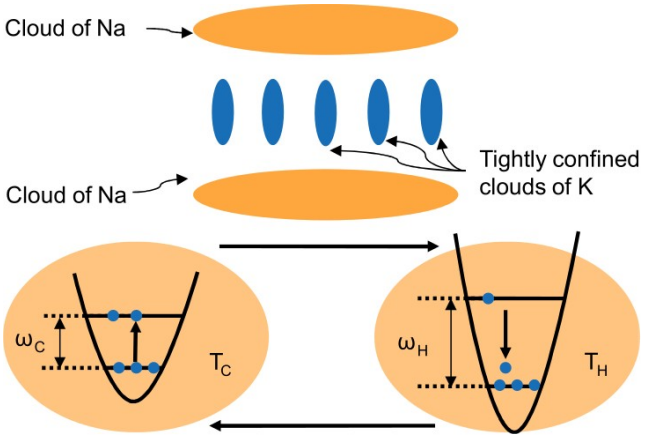
Lilo Höcker
CQD Colloquium Pretalk



Cold atomic mixtures

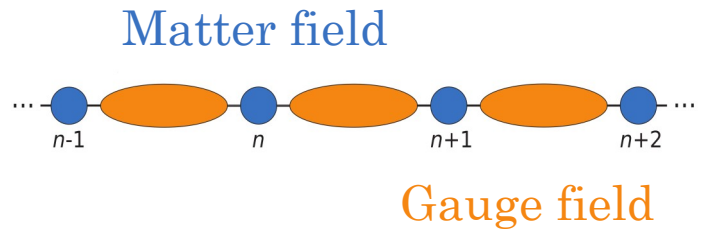


Quantum Thermodynamics



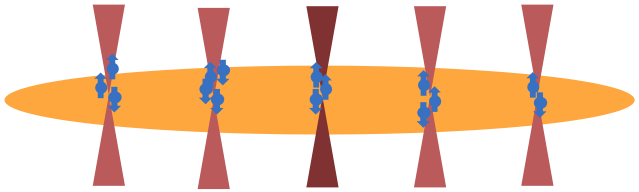
Quantized refrigerator for an atomic cloud, Niedenzu et al., Quantum 3, 155 (2019)

Dynamical Gauge Fields



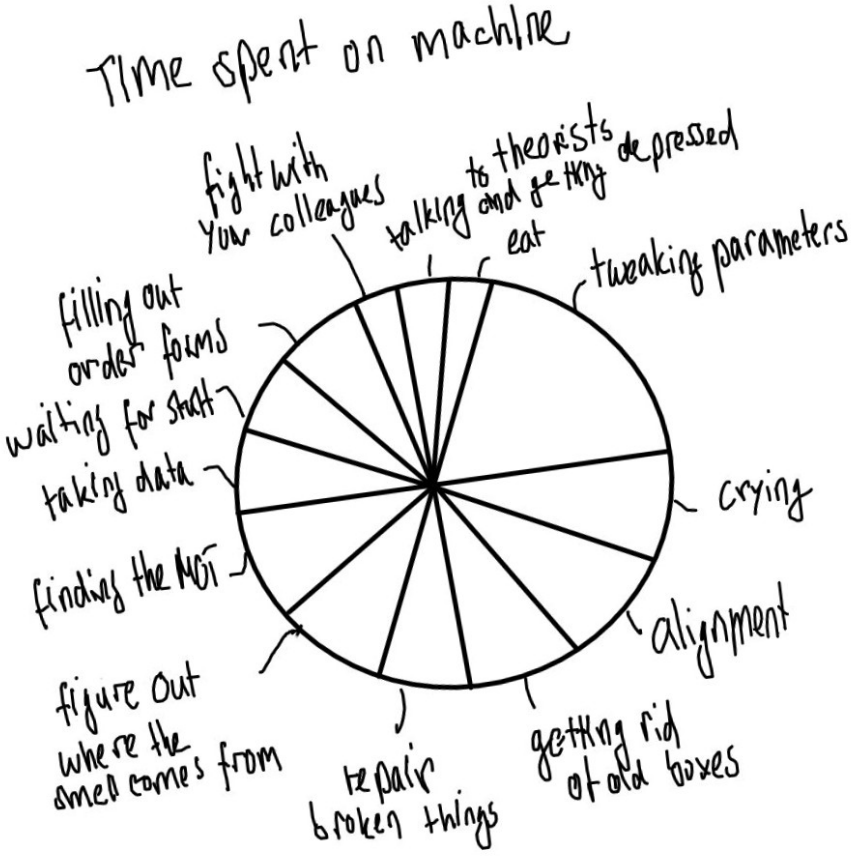
Experimental realization of U(1) gauge invariance in ultracold atomic mixtures, Mil et al., Science **367**, 1128 (2020).

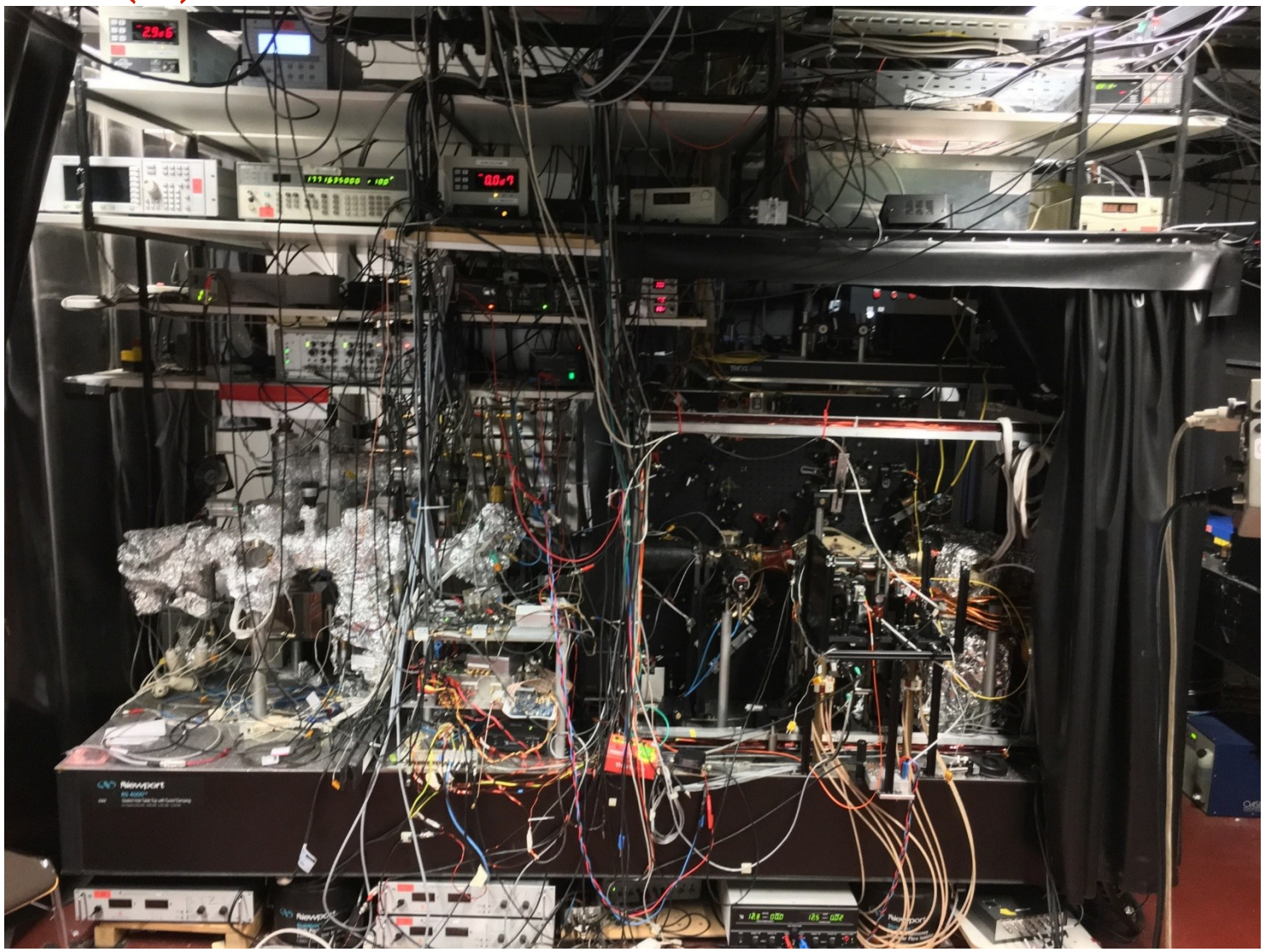
Universal Quantum Computation



Universal quantum computation and quantum error correctionwith ultracold atomic mixtures, Kasper et al., e-Print: arXiv: 2010.15923 (2020)

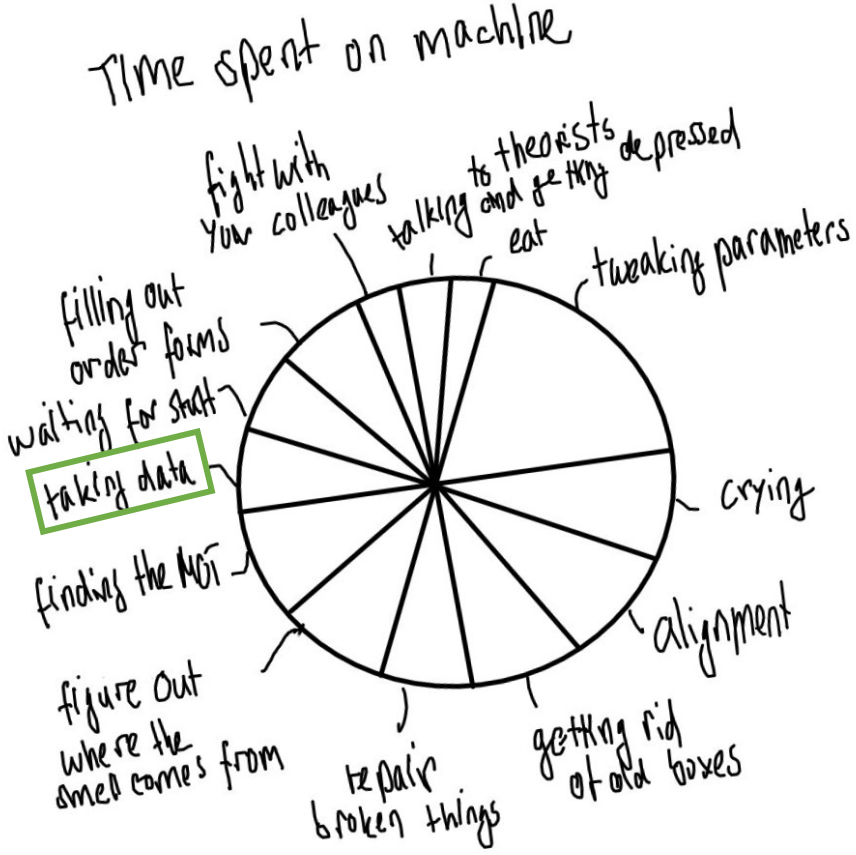
The ultra (c)old machine

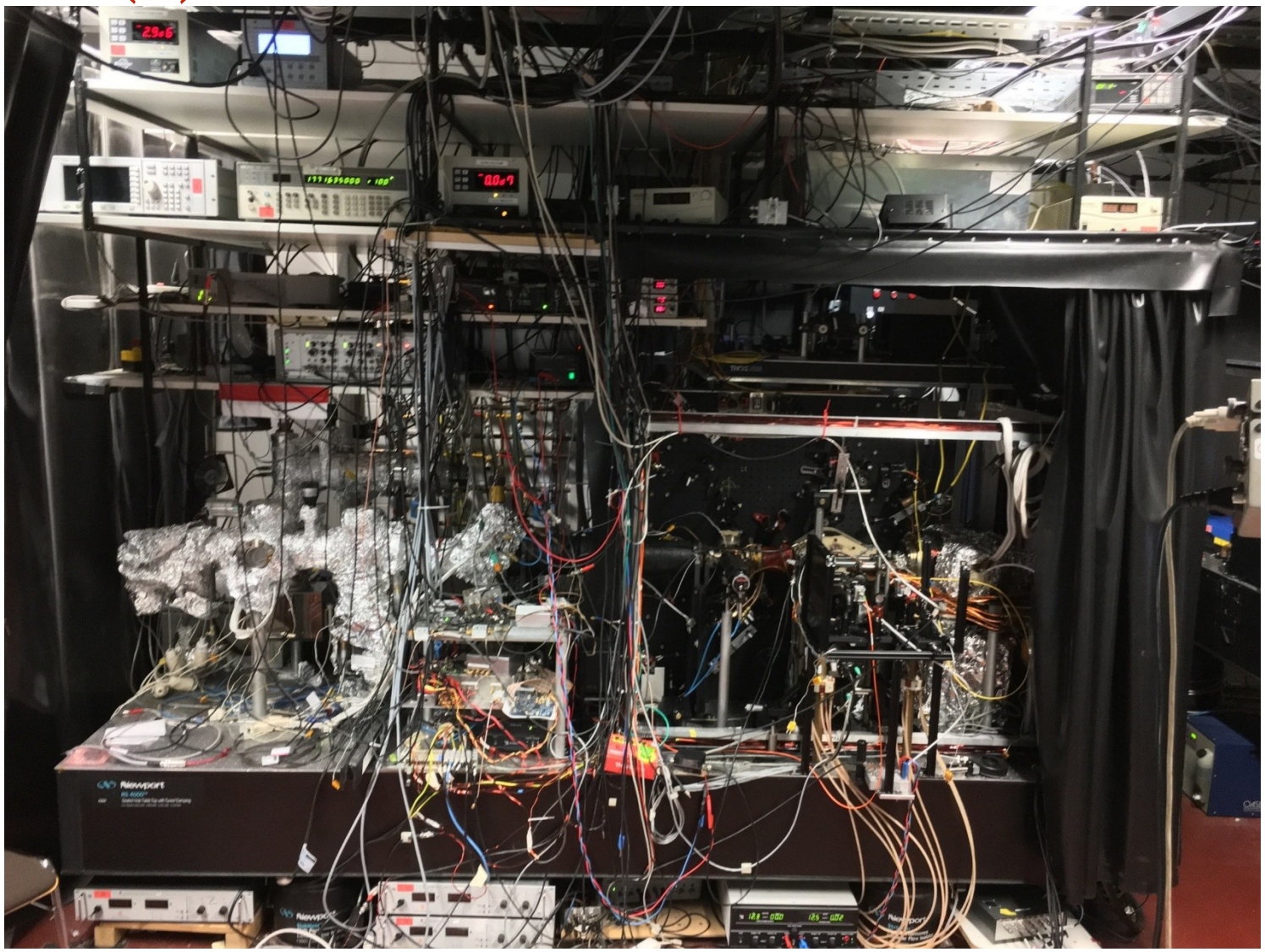




2.5 m

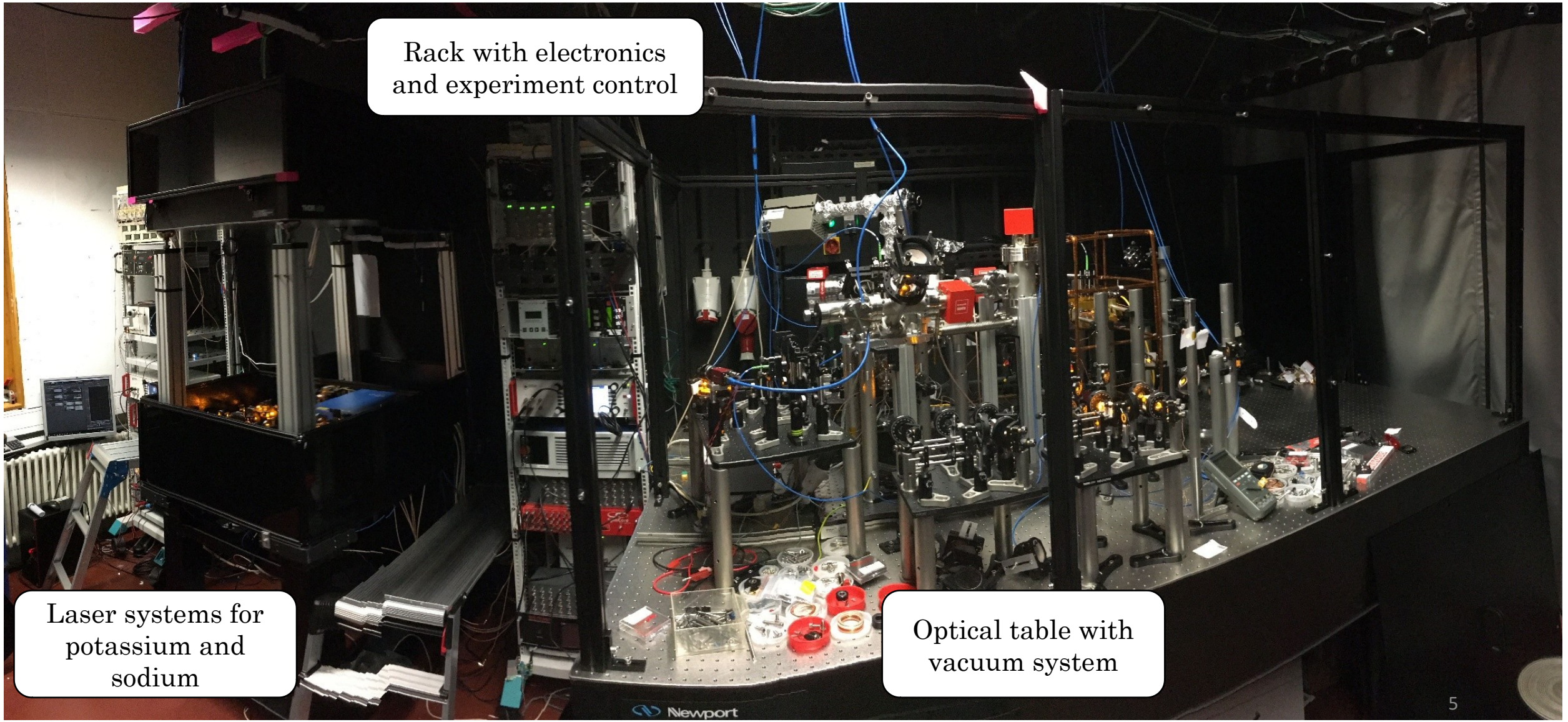
The ultra (c)old machine



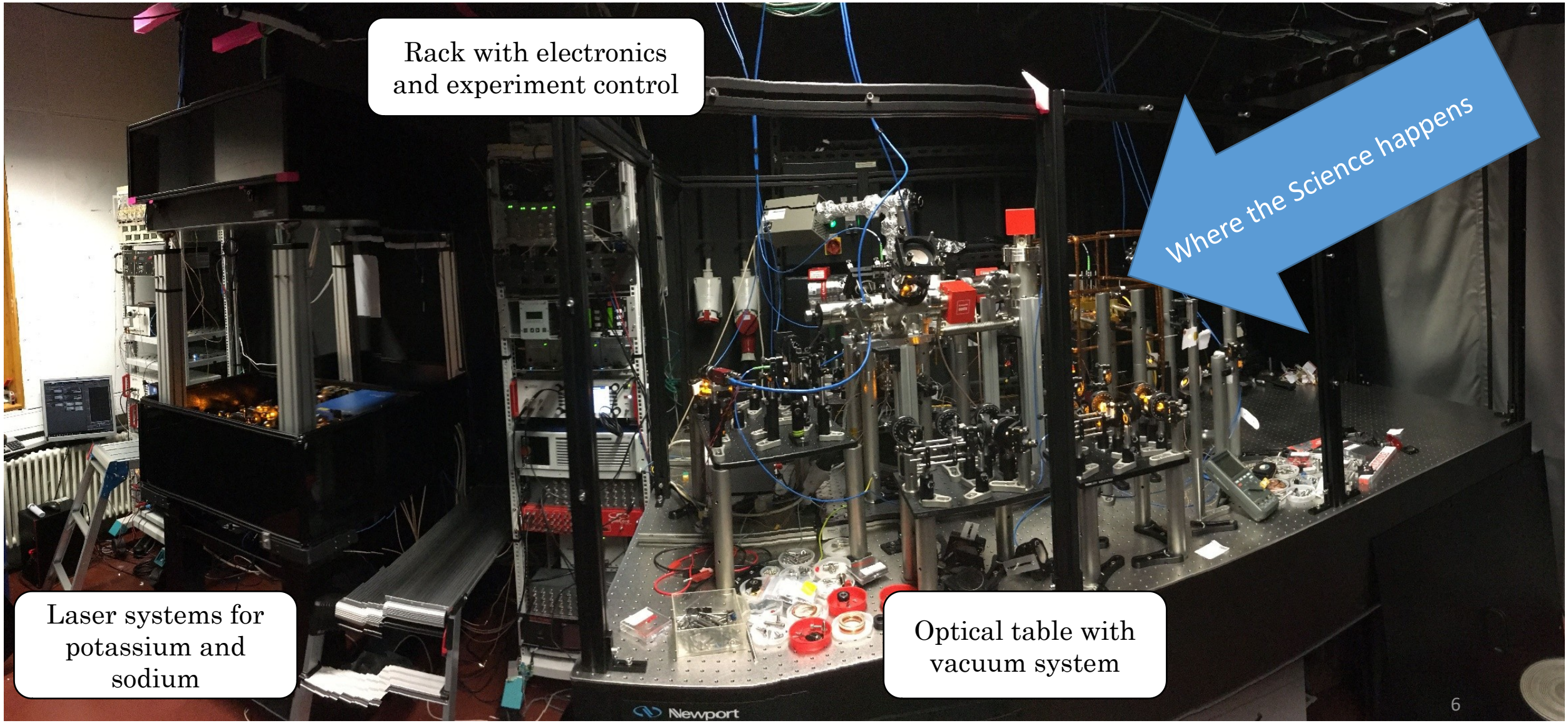


2.5 m

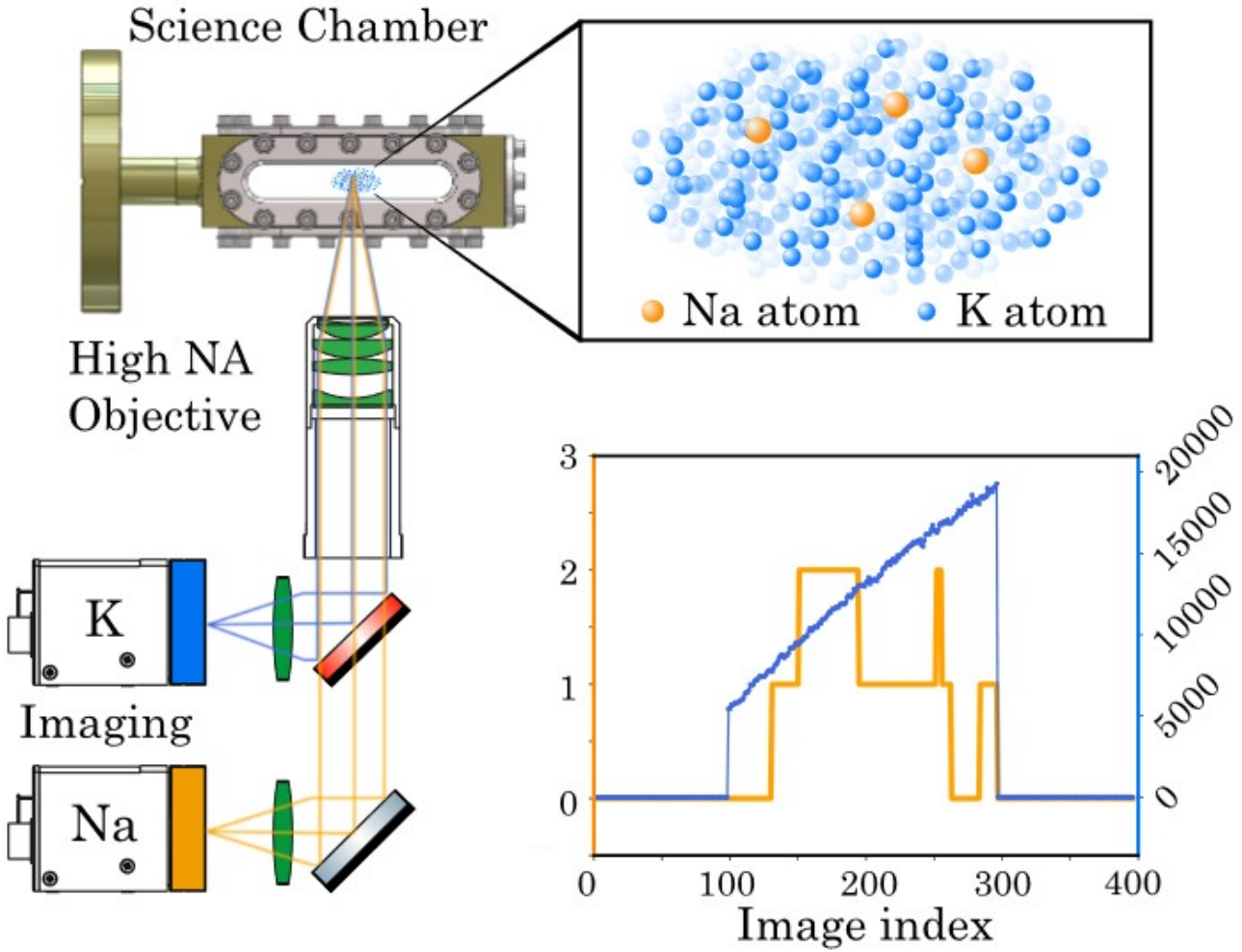
SoPa: Another cool machine

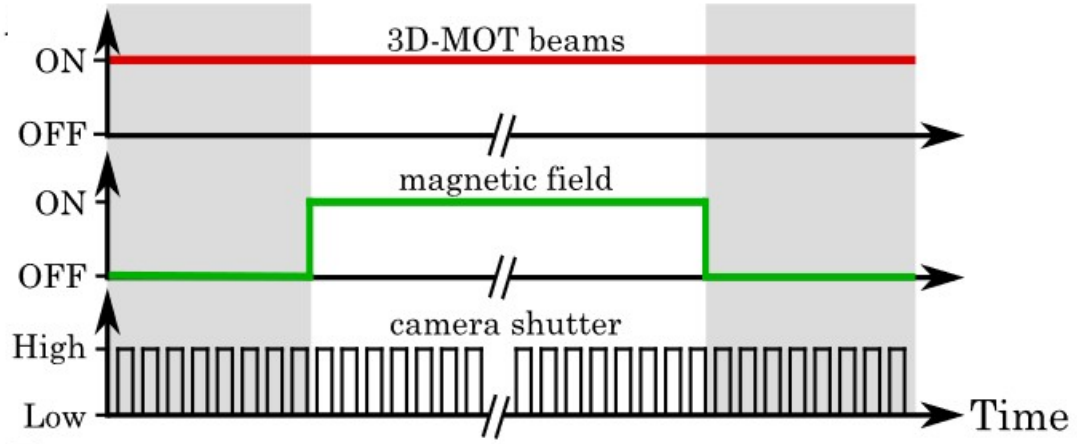


SoPa: Another cool machine

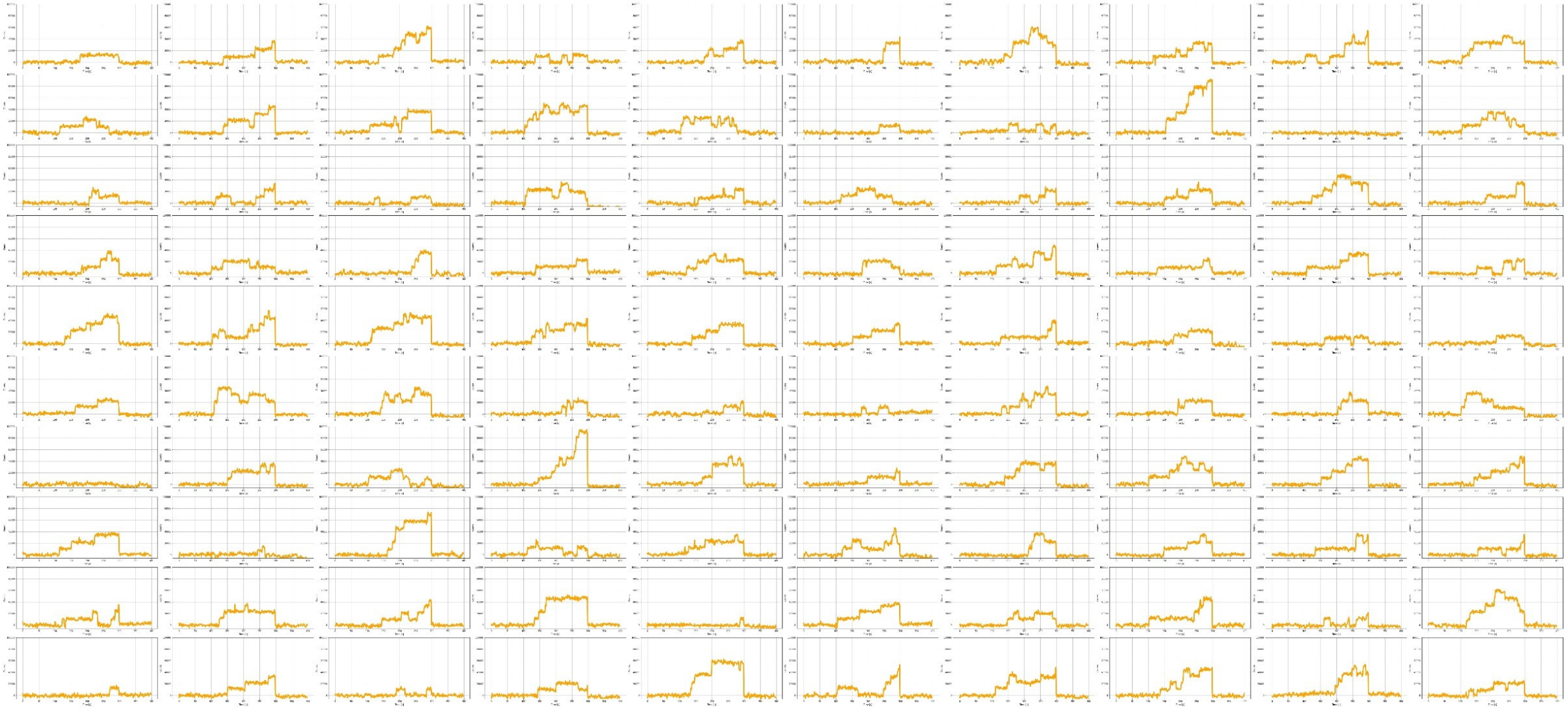


Single atom counting

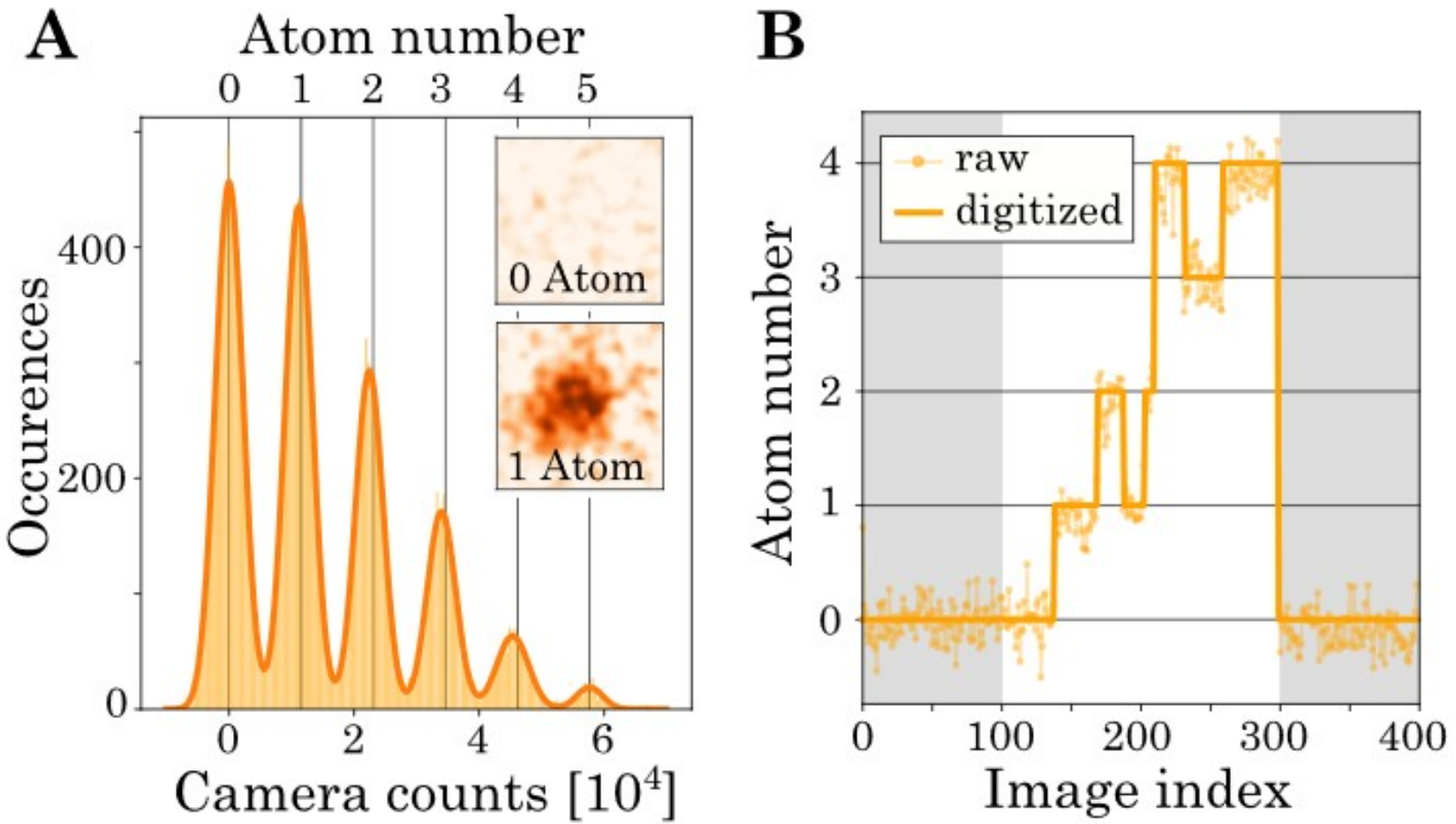




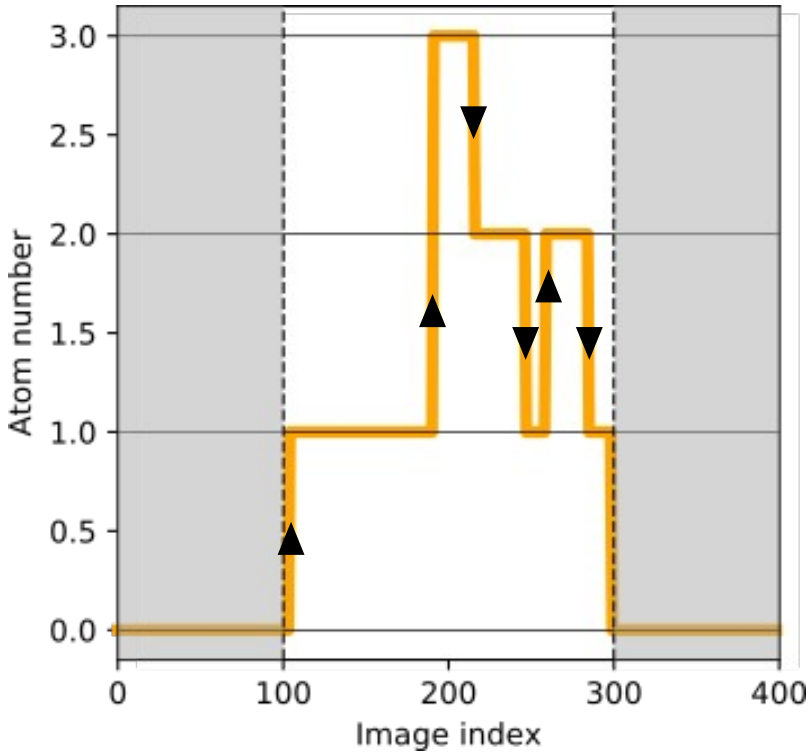
Time traces

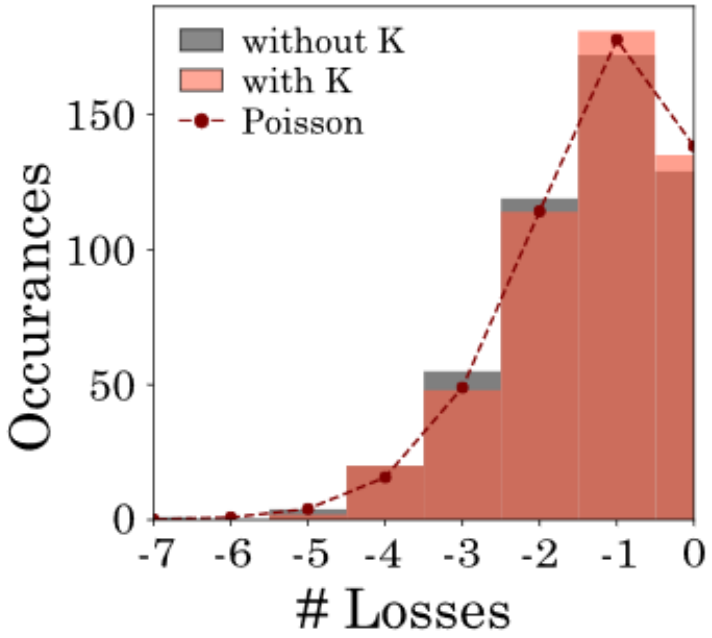


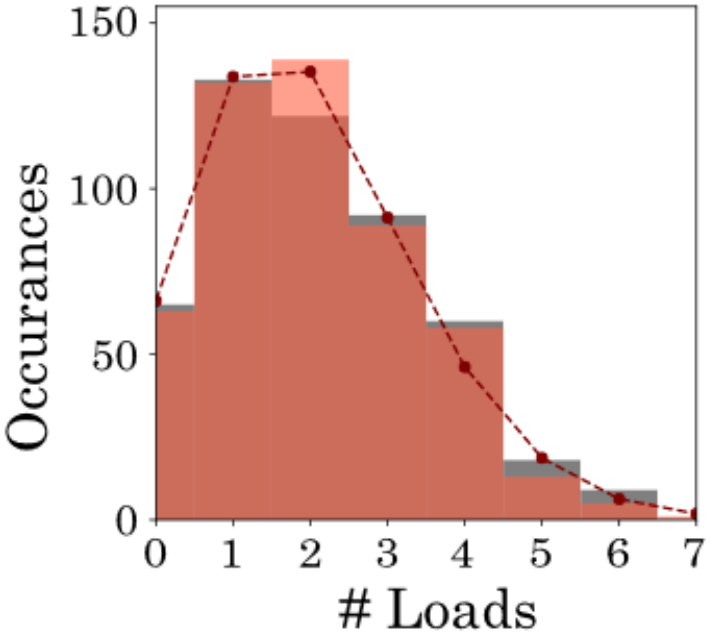
Single atom counting & digitization



MOT dynamics







Loss Process

$$p_{\text{loss}} = \frac{N_{\text{loss}}}{\sum_i N_i}$$

Loading Process

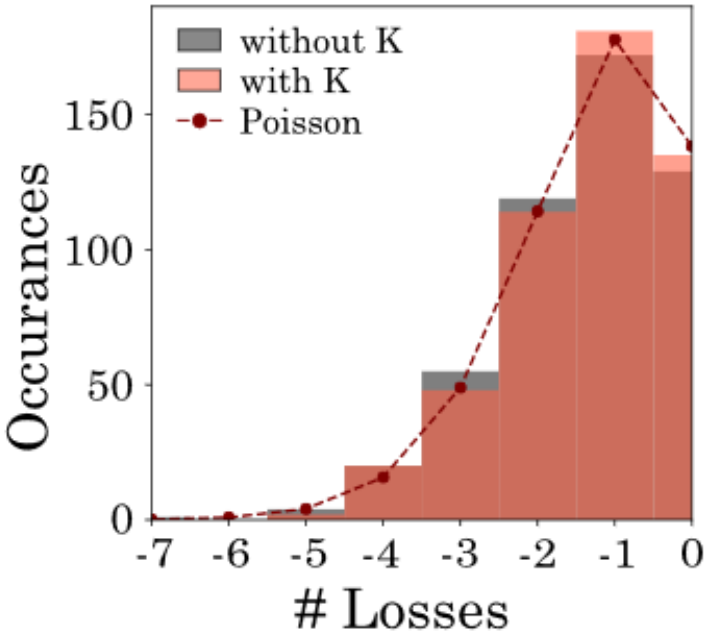
$$p_{\text{load}} = \frac{N_{\text{load}}}{N_{\text{img}}}$$

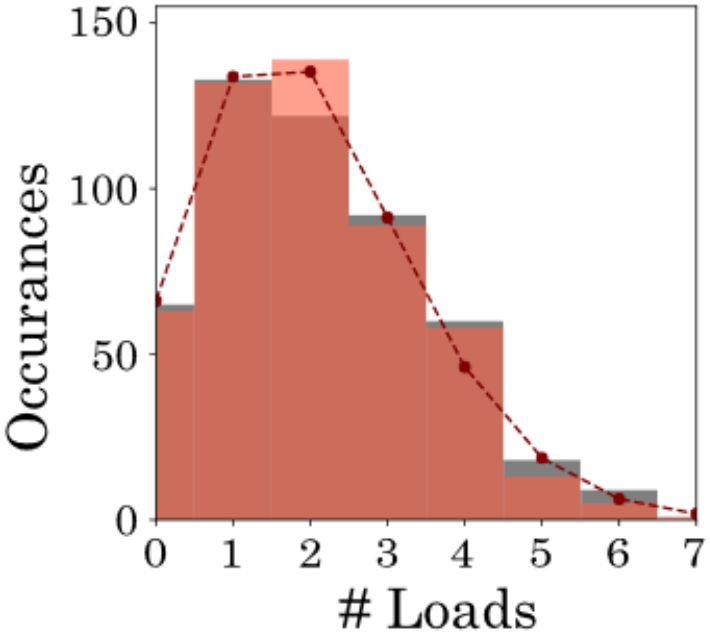
MOT dynamics

Influence of K atoms

	p_{load} [%]	p_{loss} [%]
Without K	1.06(3)	2.76(23)
With K	1.02(3)	2.47(24)

Stochastic dynamics of a few sodium atoms in a cold potassium cloud, Rohit Prasad Bhatt, Jan Kilinc, Lilo Höcker, Fred Jendrzejewski (2021). arXiv:2101.01135.





Loss Process

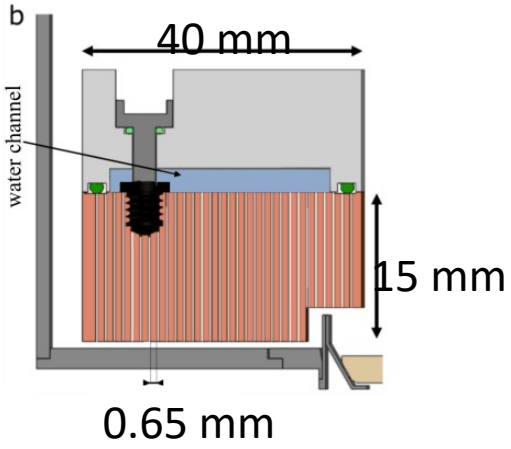
$$p_{\mathrm{loss}} = \frac{N_{\mathrm{loss}}}{\sum_i N_i}$$

Loading Process

$$p_{\mathrm{load}} = \frac{N_{\mathrm{load}}}{N_{\mathrm{img}}}$$

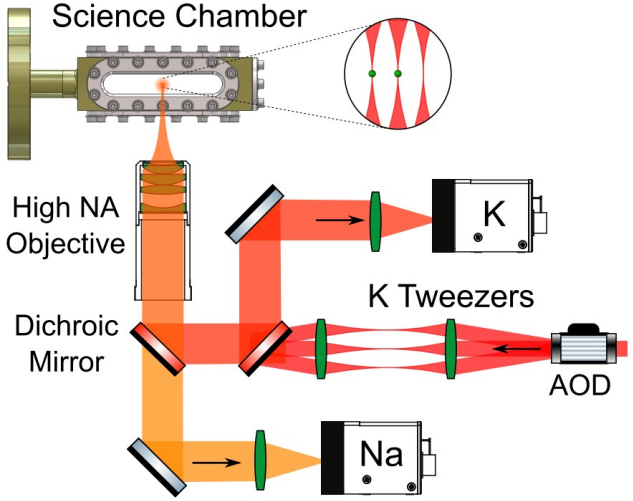
Current status

New Coils

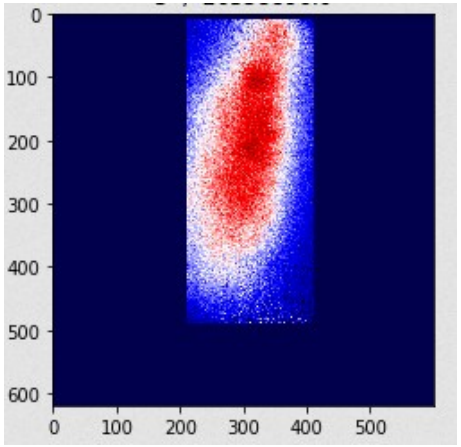


Compact bulk-machined electromagnets for quantum gas experiments, Roux and B. Cilenti and V. Helson and H. Konishi and J. P. Brantut SciPost Phys. 6,4 2019

Optical Tweezer



Magnetic Trap



Dipole trap