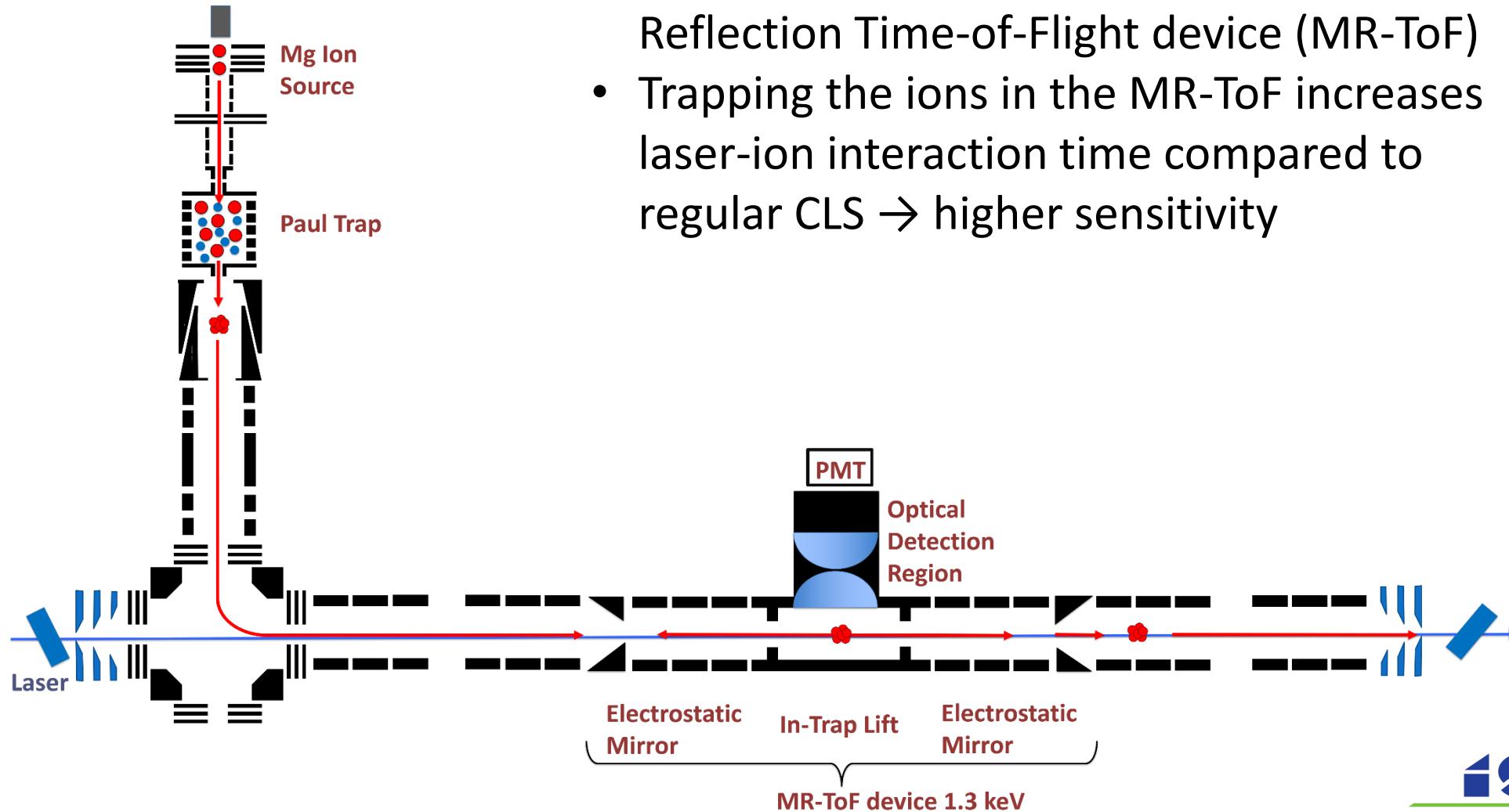


High-Voltage Stabilization of MIRACLS' Proof-of-Principle Experiment

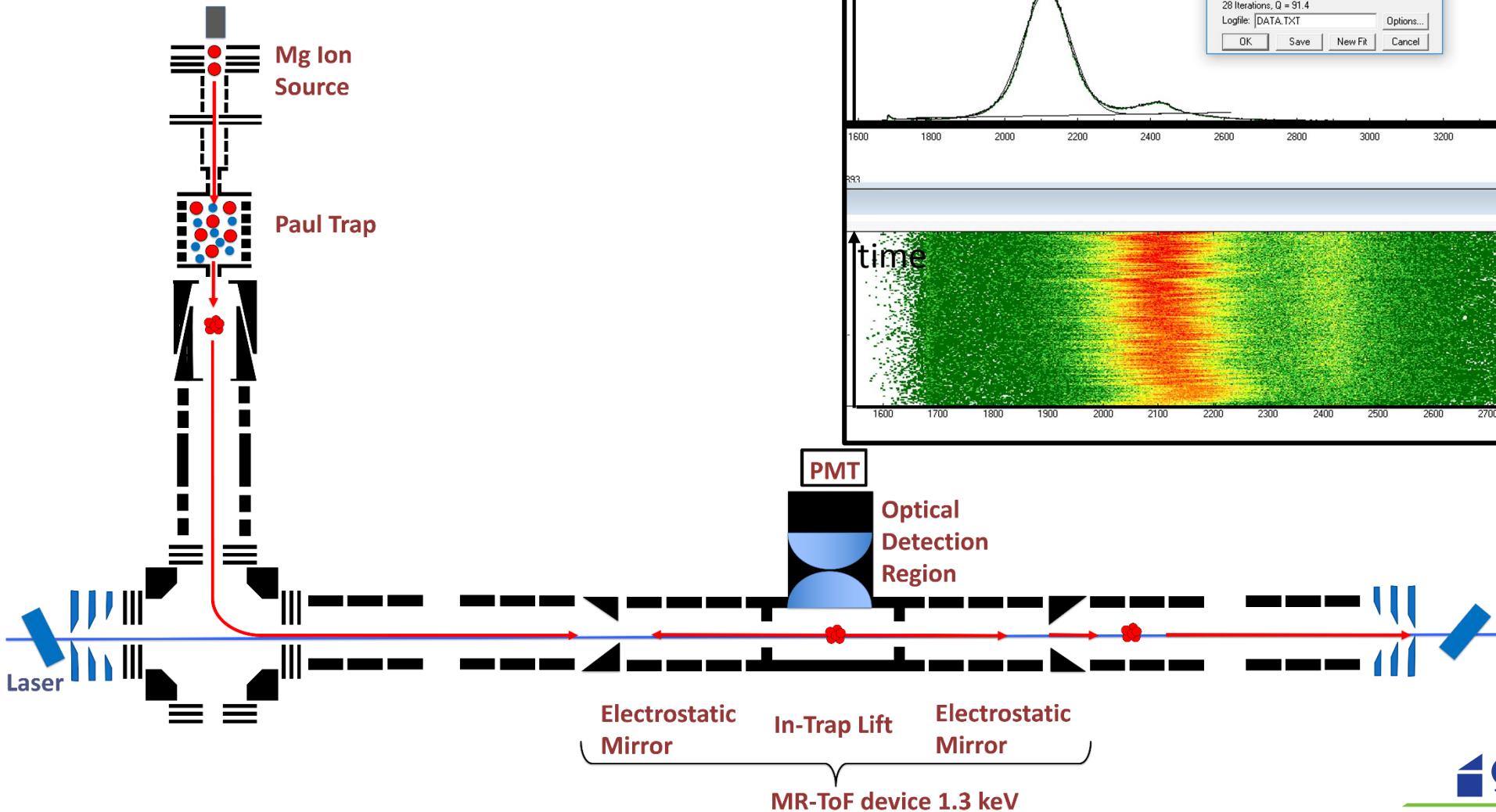
C. Kanitz, P. Fischer, V. Lagaki, S. Lechner, F.M. Maier,
P. Plattner, S. Sels, M. Vilen,
F. Wienholtz, L. Schweikhard, S. Malbrunot-Ettenauer



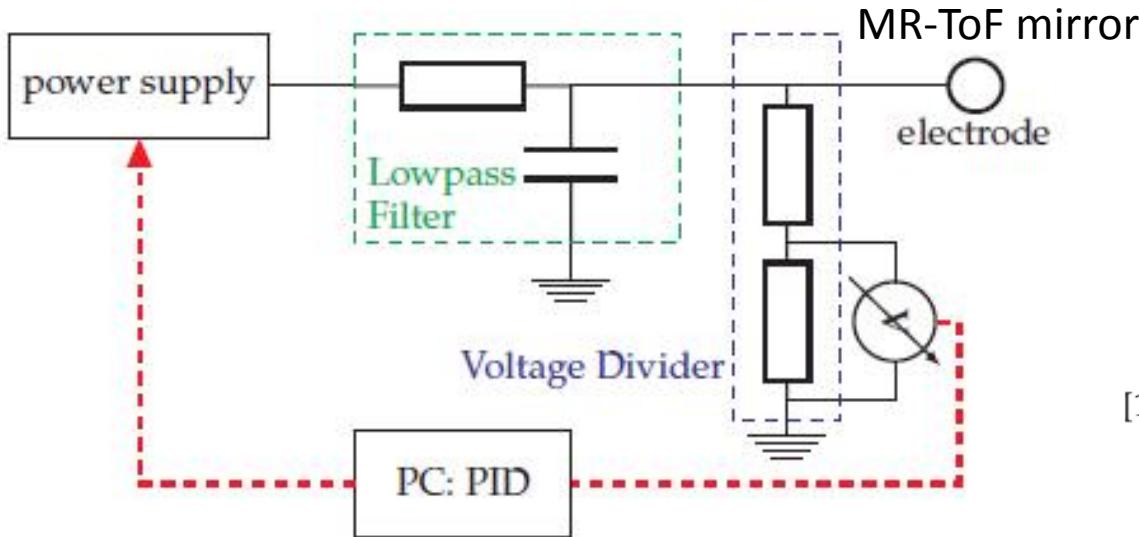
MIRACLS' PoP Experiment



MIRACLS' PoP Experiment



High-Voltage Stabilization



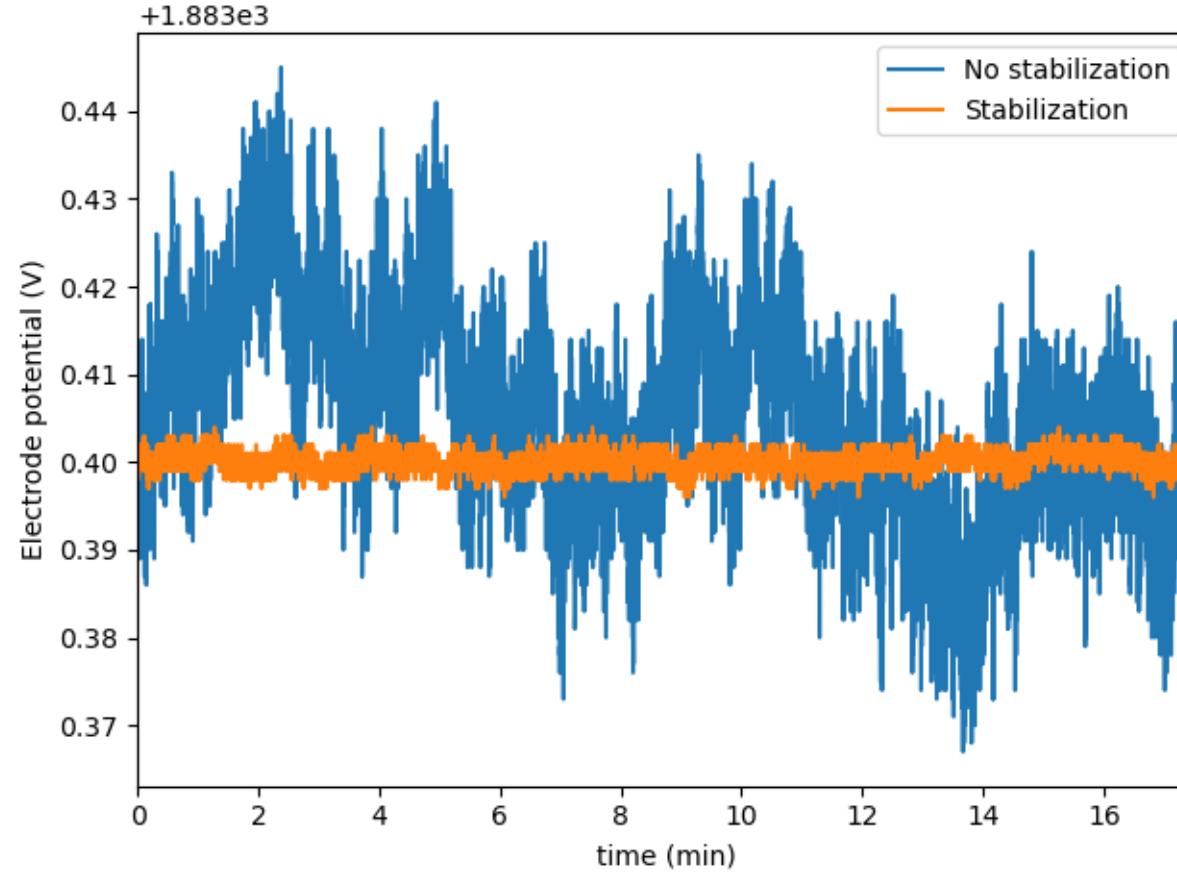
Implemented analogously to [1], now for multiple mirror electrodes

[1] F. Wienholtz et al. Improved stability of multi-reflection time-of-flight mass spectrometers through passive and active voltage stabilization. *Nucl. Instrum. Methods Phys. Res. B*, 463:348 – 356, 2020.

Based on low-cost (50 CHF) voltage divider (TC 5 ppm):



Voltage stability improvement



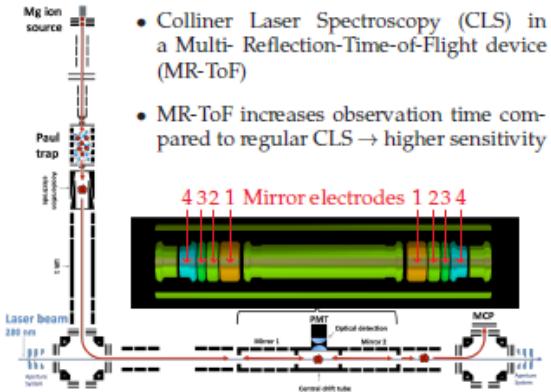
HIGH-VOLTAGE STABILIZATION OF MIRACLS' PROOF-OF-PRINCIPLE EXPERIMENT

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 V. Lagaki^{1,3}
 S. Lechner^{1,4}
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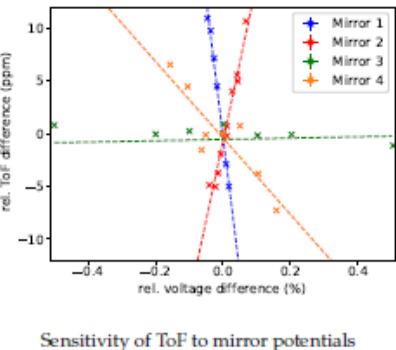


1 PROOF-OF-PRINCIPLE EXPERIMENT

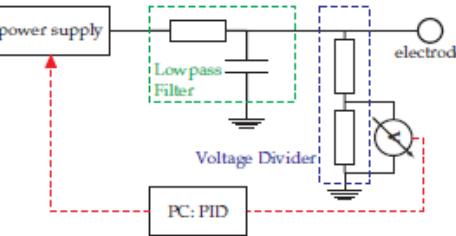


2 MOTIVATION

- CLS linewidth can be broadened by time-of-flight variations of the ion bunch
- Moreover, voltage instabilities lead to ToF fluctuations



3 VOLTAGE STABILIZATION SETUP

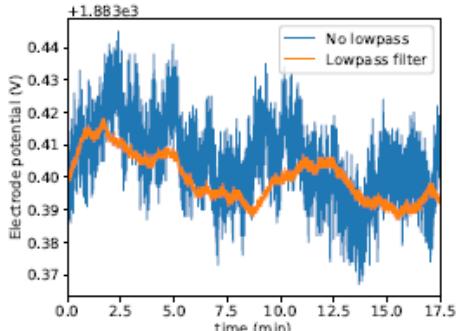


Based on low-cost (50 CHF) voltage divider (TC 5 ppm):



4 PASSIVE STABILIZATION

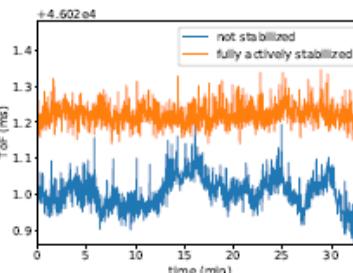
Lowpass filter with $\tau = R \cdot C = 40$ s.
 Voltage measured at mirror electrode 4:



5 ACTIVE STABILIZATION

Mirror 2 and 4 are stabilized by a lowpass filter and a PID loop, mirror 1 and 3 are only stabilized via a PID loop.

Relative standard deviation of the ToF and voltage signal:



Conclusion:

A significant improvement of the ToF signal stability can be achieved, which reduces the ToF width of an ion signal measured in a longer measurement run. The improvement shown here, can be excelled by stabilizing the most sensitive mirror passively and actively. The passive stabilization enables the active stabilization to work effectively.

REFERENCES

- [1] F. Wienholtz et al. Improved stability of multi-reflection time-of-flight mass spectrometers through passive and active voltage stabilization. *Nucl. Instrum. Methods Phys. Res. B*, 463:348–356, 2020.

OUTLOOK

- Comparison to SimION simulations
- Improvement of CLS linewidth due to voltage stabilization
- Implementation into the compactMIRACLS experiment, currently under construction

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