Ion Time of Flight Spectrometer for Multi- Photoionization Studies

From Scratch to Realization

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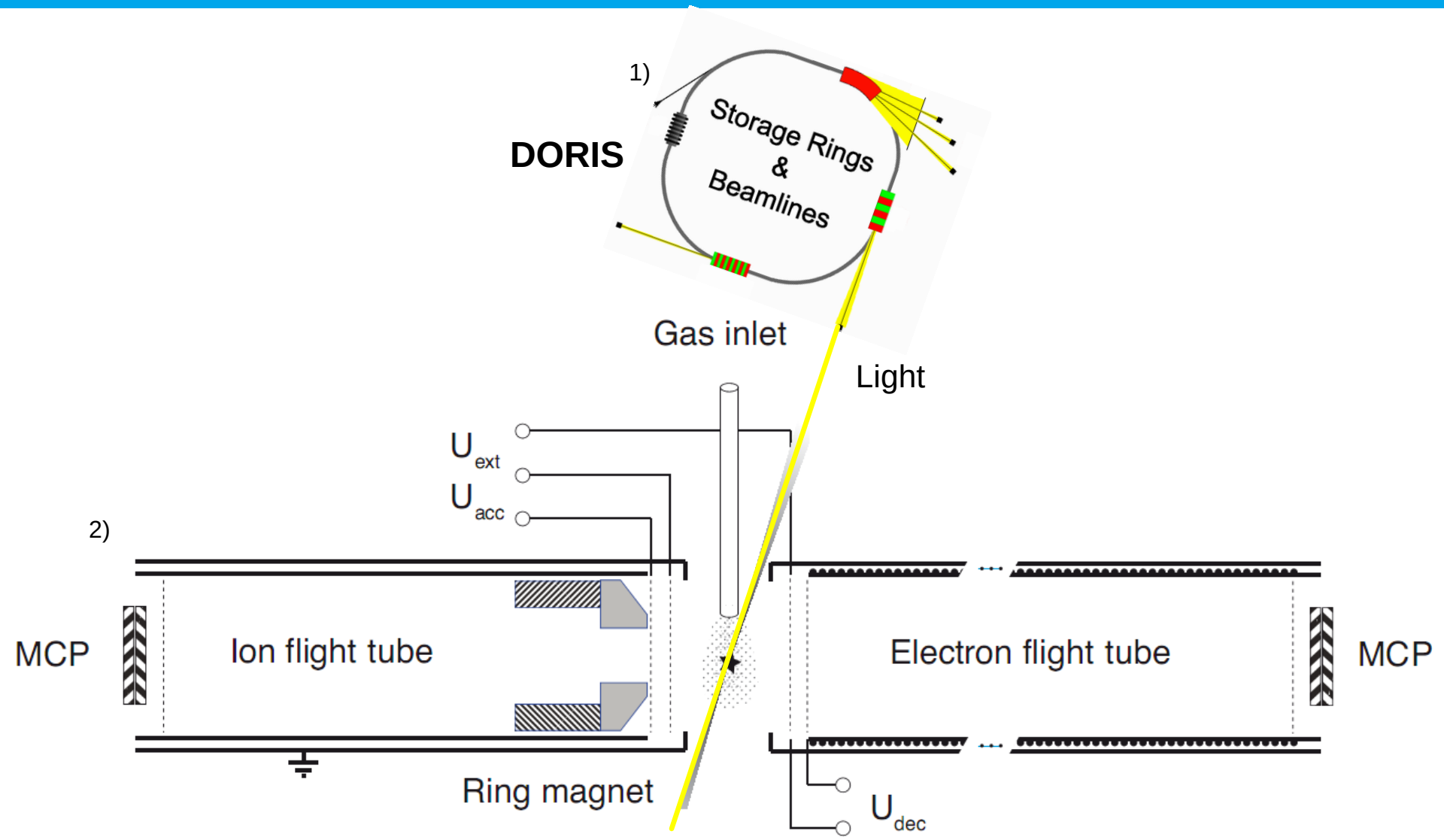
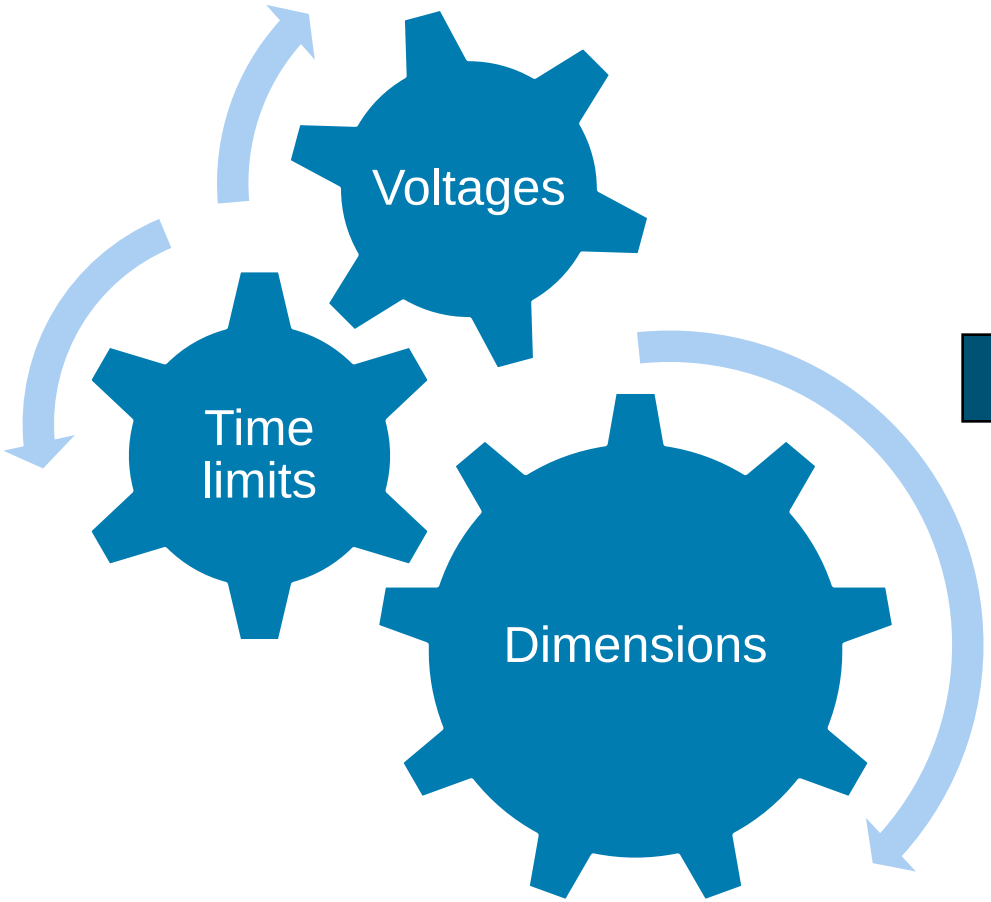
DESY

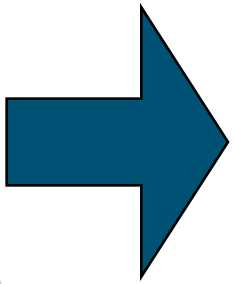
The idea of building iTOF spectrometer for Multi-Photoionnization



Figures from:
1) http://hasylab.desy.de
2) „Multi-Electron Coincidence Studies of Atoms and Molecules" – Egil Andersson, Acta Universitatis Upsaliensis Uppsala 2010

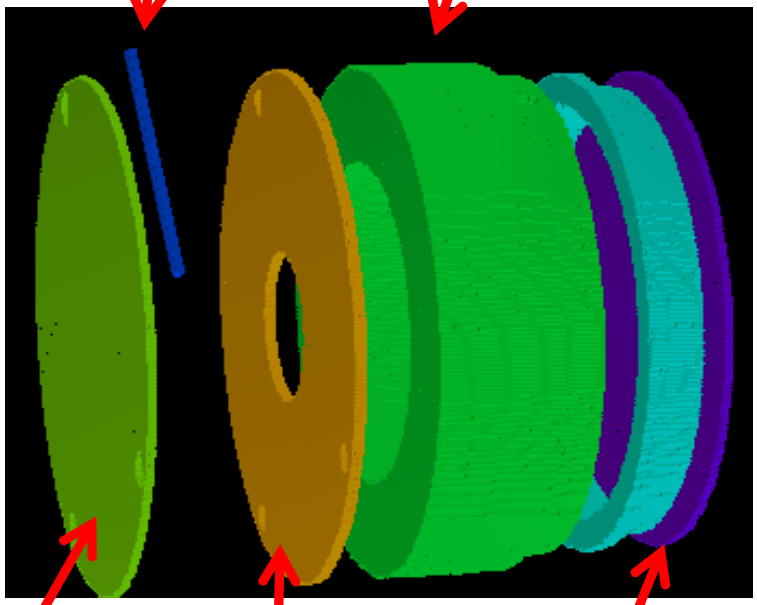
Objectives of the simulation:

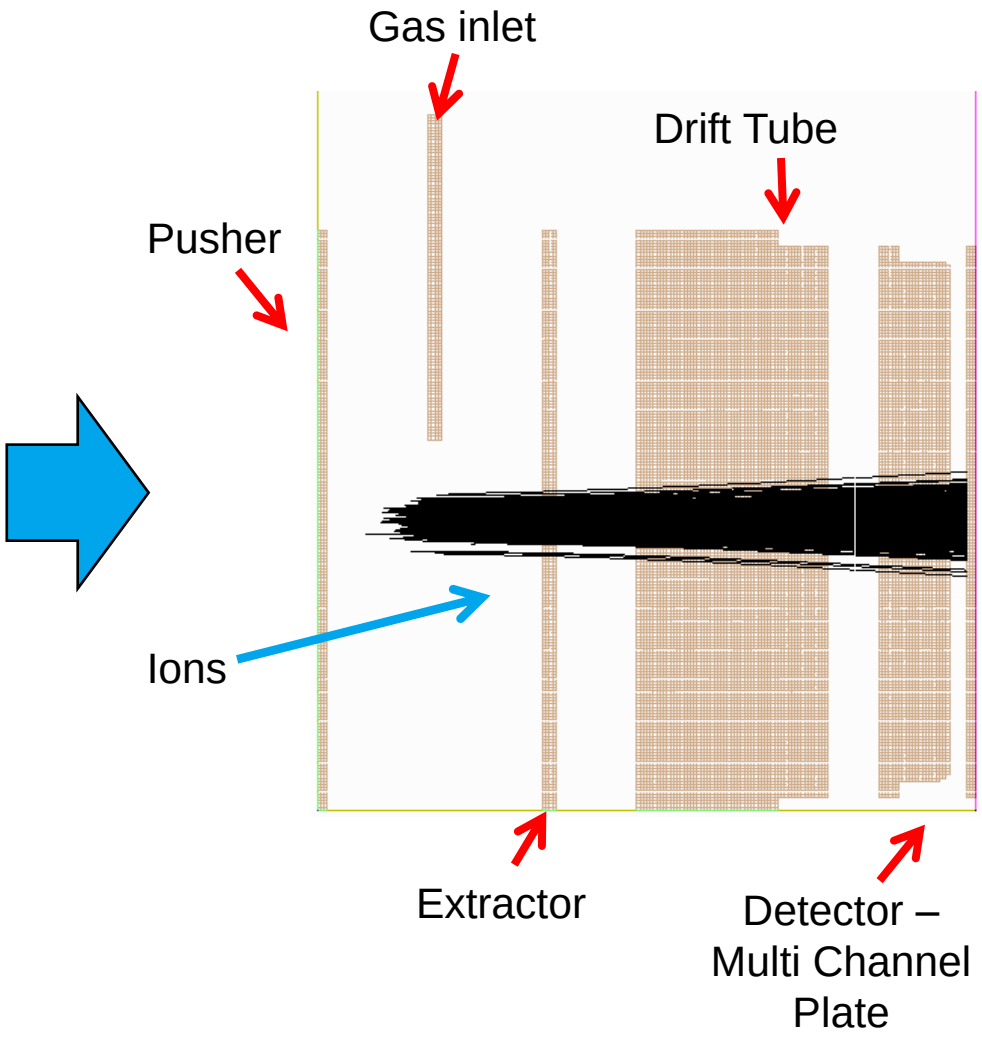




BEST RESOLUTION

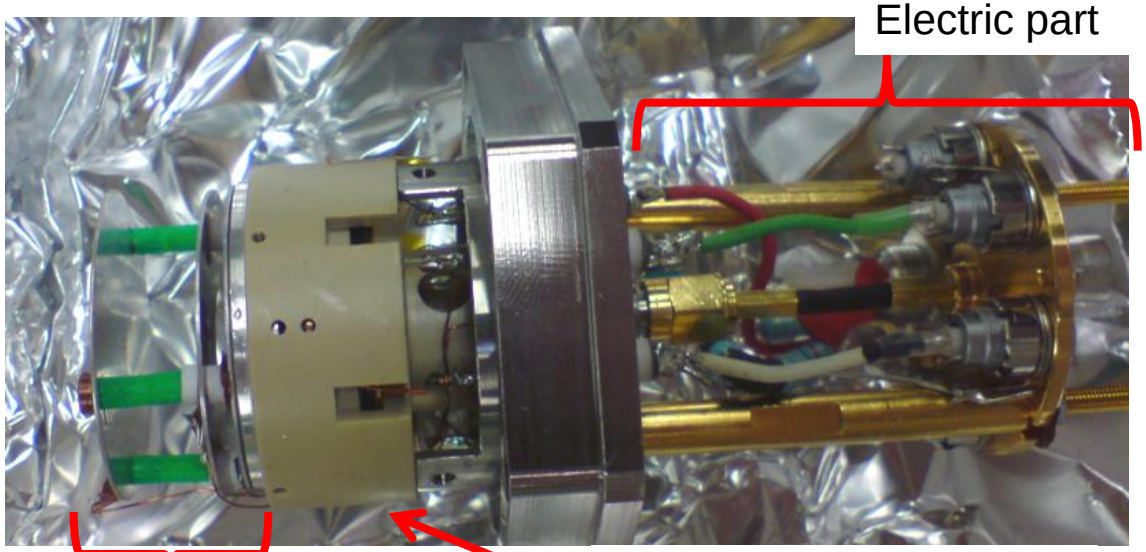
Lets go deeper – Simulations (SIMION)



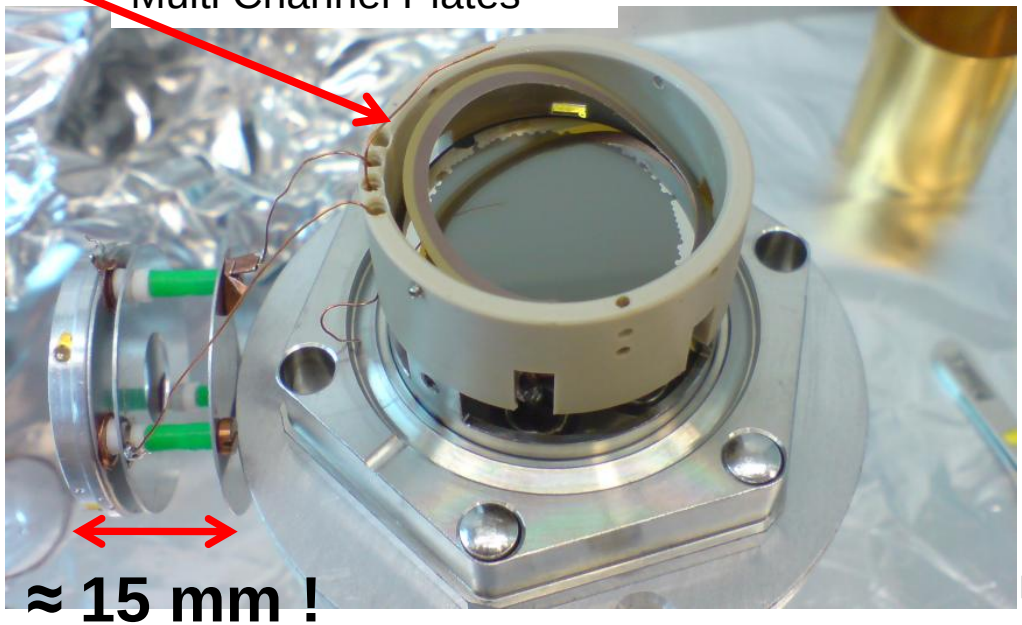


20 GB of data from only simulation!

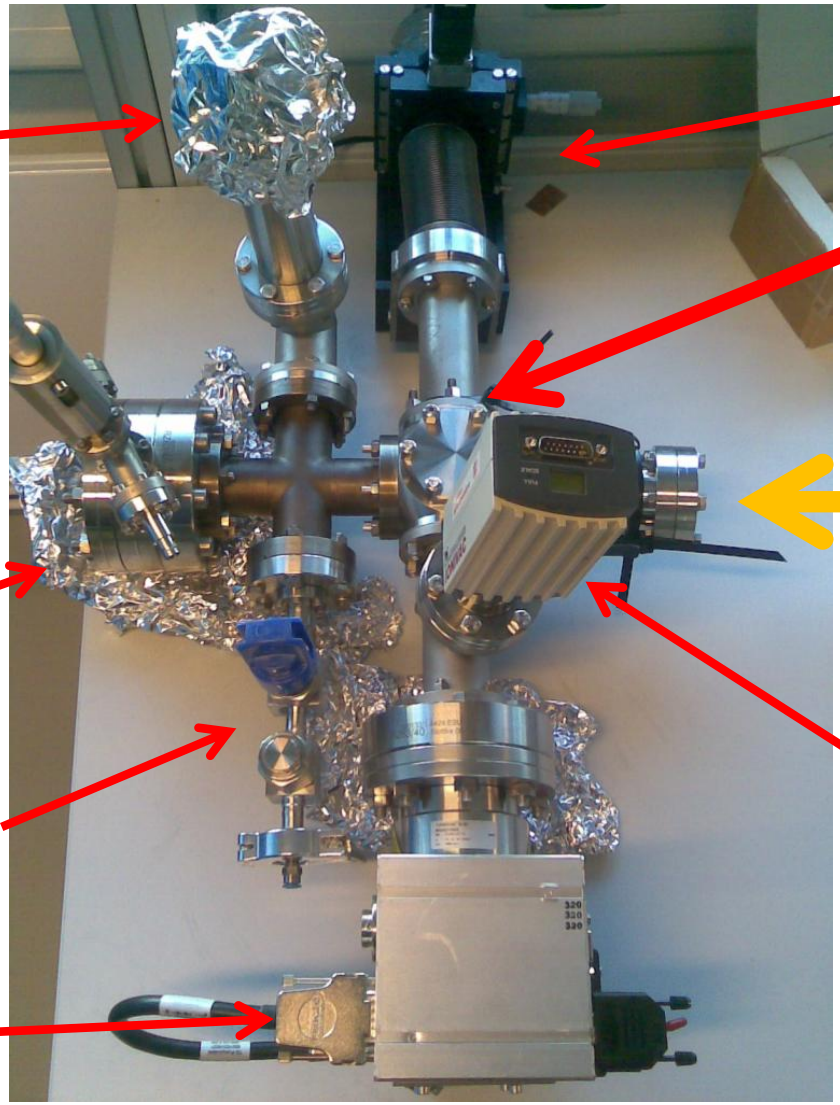
Let's do it! – Building the experimental set up - Detector



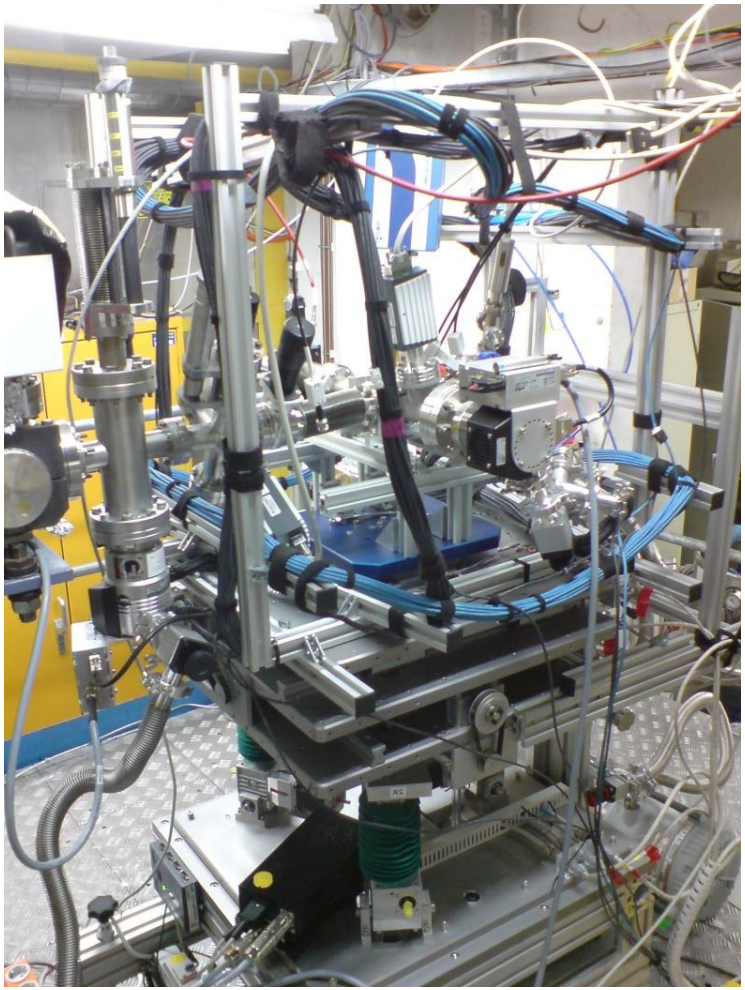
Multi Channel Plates



Let’s do it! – Building the experimental set up



Experiment – Experiment – Setup up at BW3/Doris



Beam-line BW3:

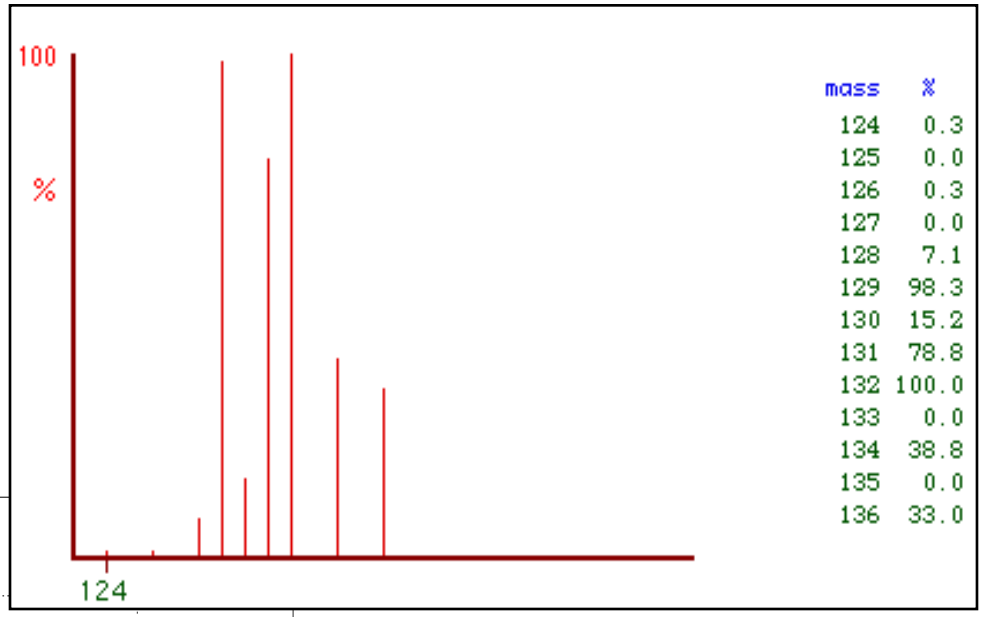
- Two undulators, 4 m length, number of periods N = 21 and 44
- 20-1500 eV photon energy region

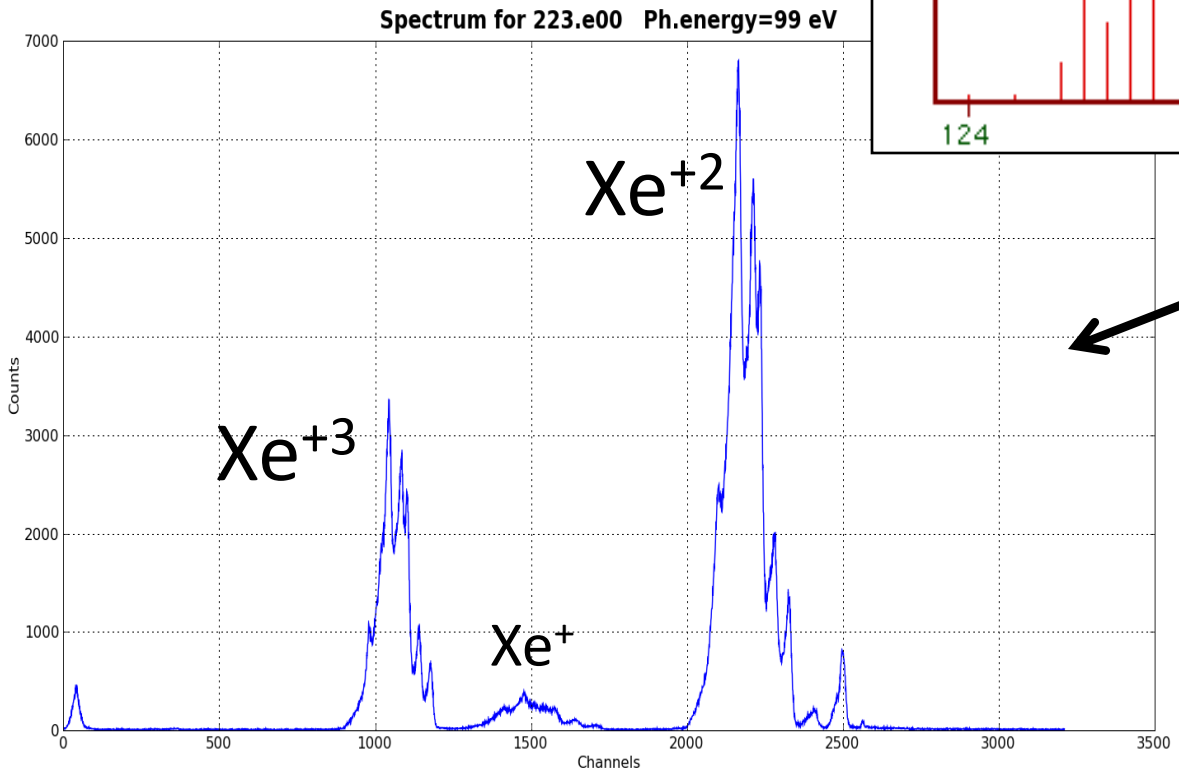
The pressure without gas:
≈ $5 \cdot 10^{-8}$ mbar

The pressure with gas (e.g. Xenon):
≈ 10^{-5} mbar

Results part I – Spectrum of Xe

Xenon isotopes

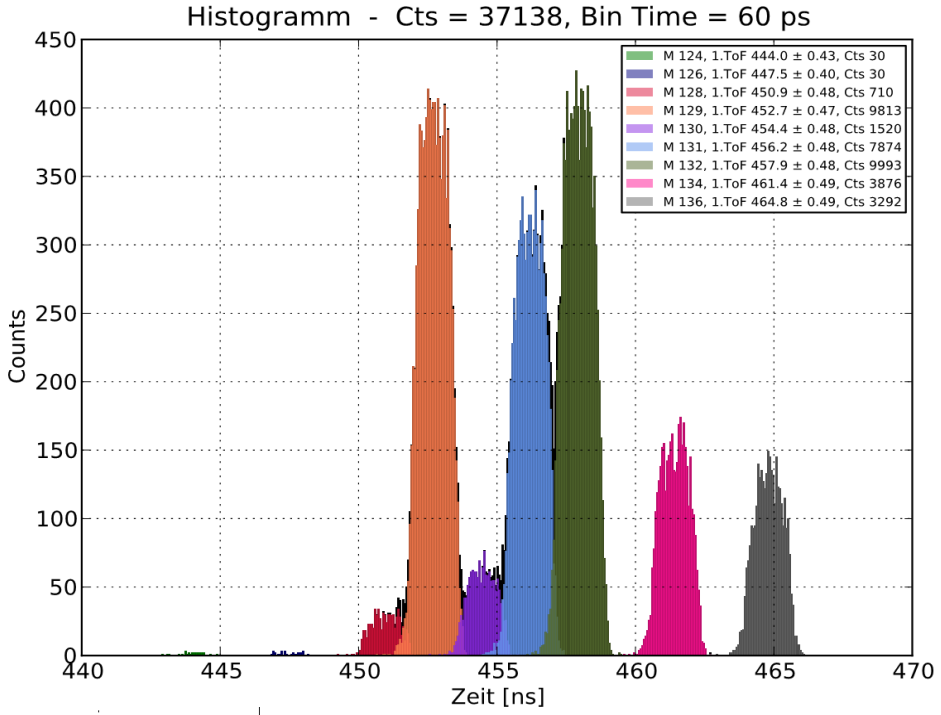


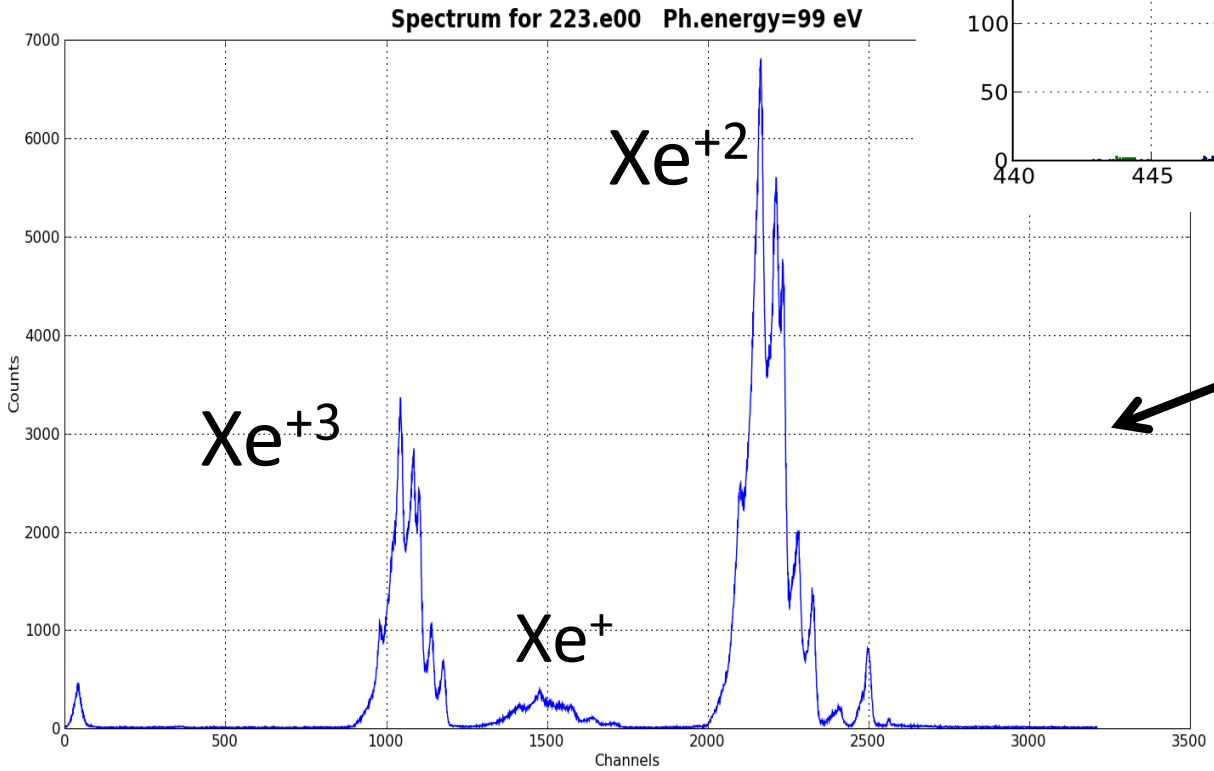


measurement

Results part II – Spectrum of Xe

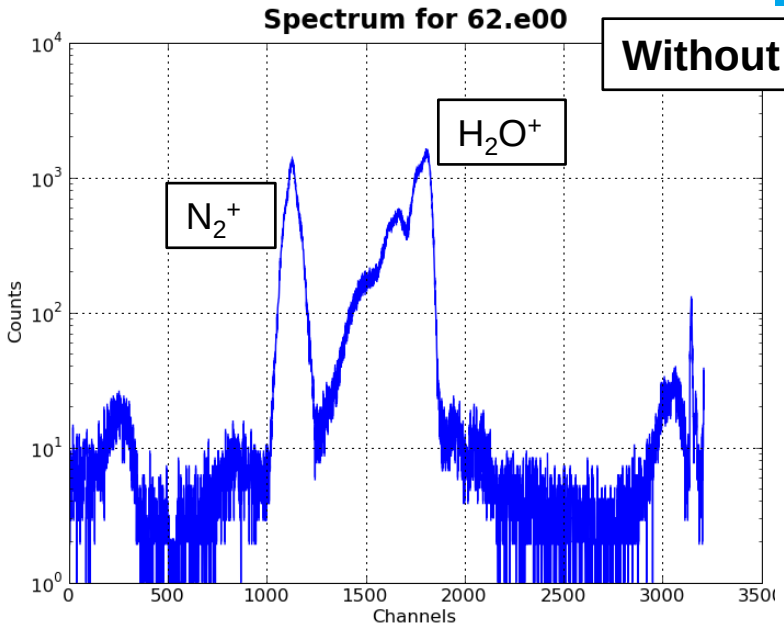
Simulation

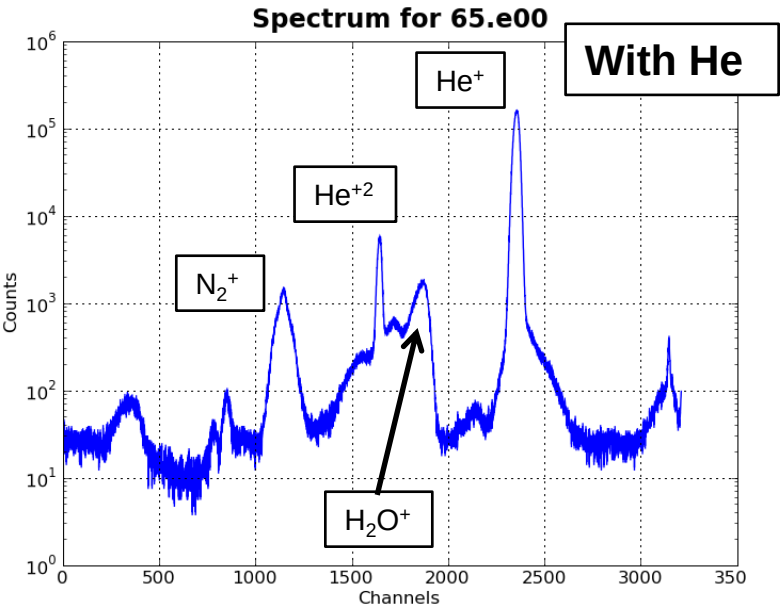




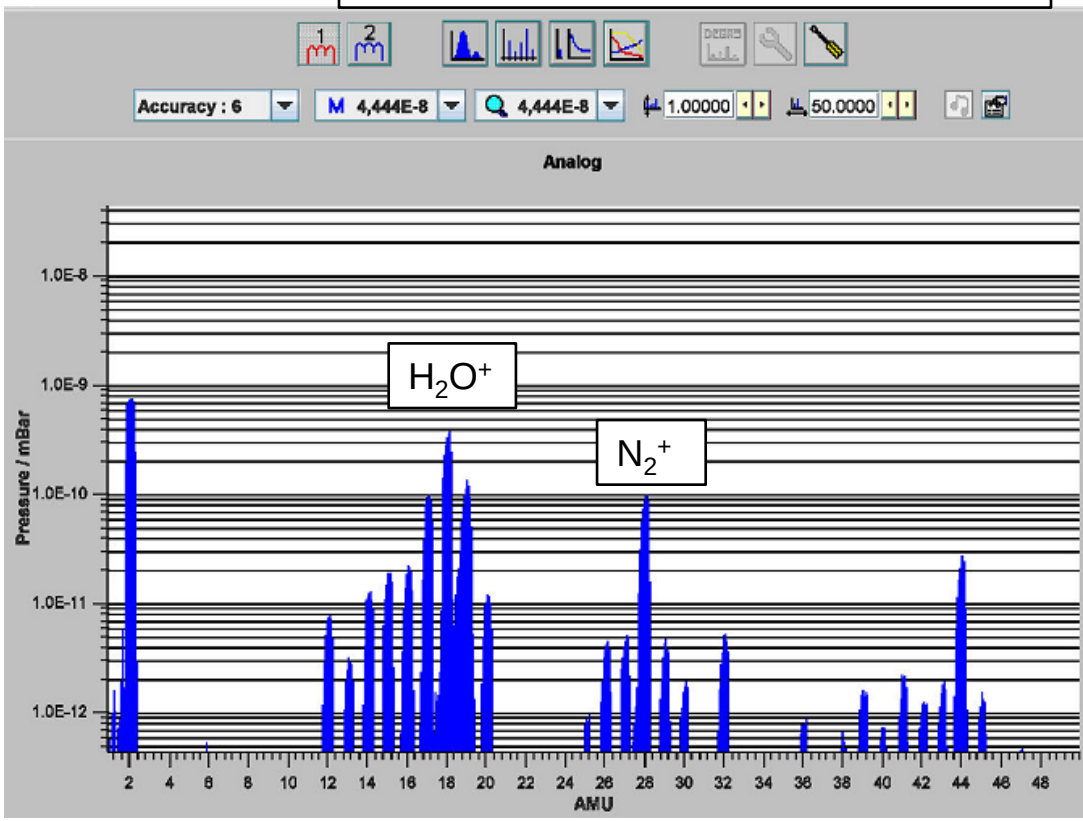
measurement

Results part III - Residual gases spectrum

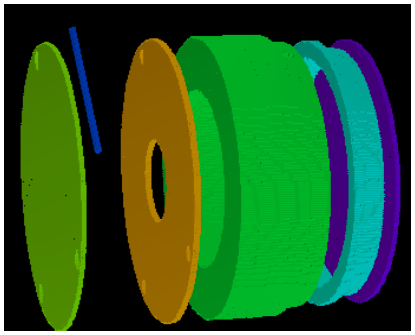


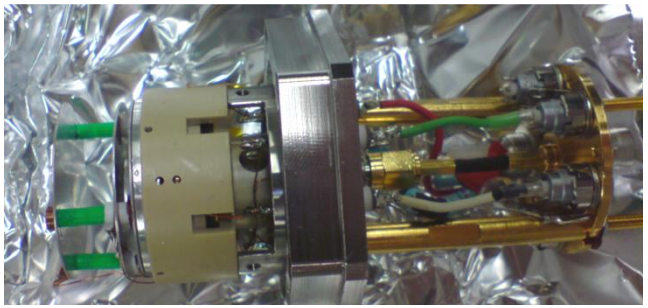


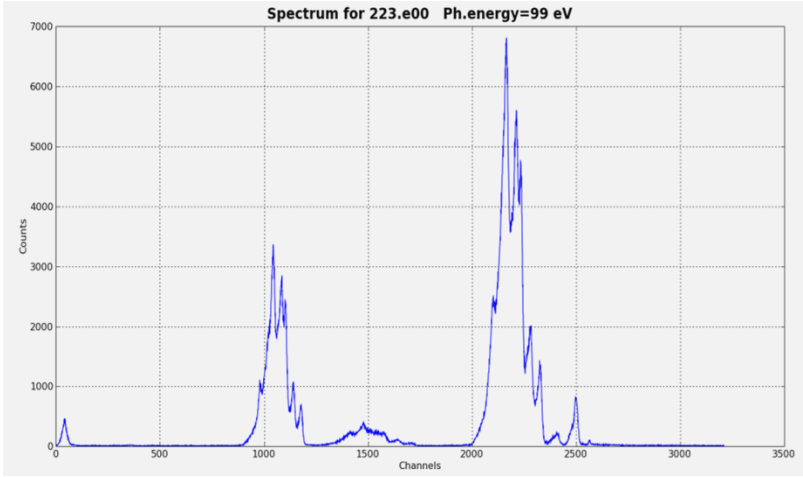
Quadrupole mass spectrometer



To sum up → From Scratch to Realization







Working setup!

Acknowledgement

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- **Markus Ilchen**
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