Surface analyses for fuel-retention and impurity-deposition patterns on marker samples and other samples from specific plasma experiments (AUG, WEST, W7-X)

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WP PWIE SP B.2: kick-off – June 11, 2021

Task description

Eurofusion PWIE SP-B.2

Task description:

Perform detailed surface analyses for fuel-retention and impurity-deposition patterns on marker samples and other samples from specific plasma experiments (AUG, WEST, W7-X)

Deliverable:

RBS, NRA, ERDA, and MEIS/LEIS characterization of marker samples and coatings from selected plasma experiments on AUG, WEST, and W7-X with conclusions

The Tandem Laboratory @ UU

Equipment for IBA & IBMM – accessible for users

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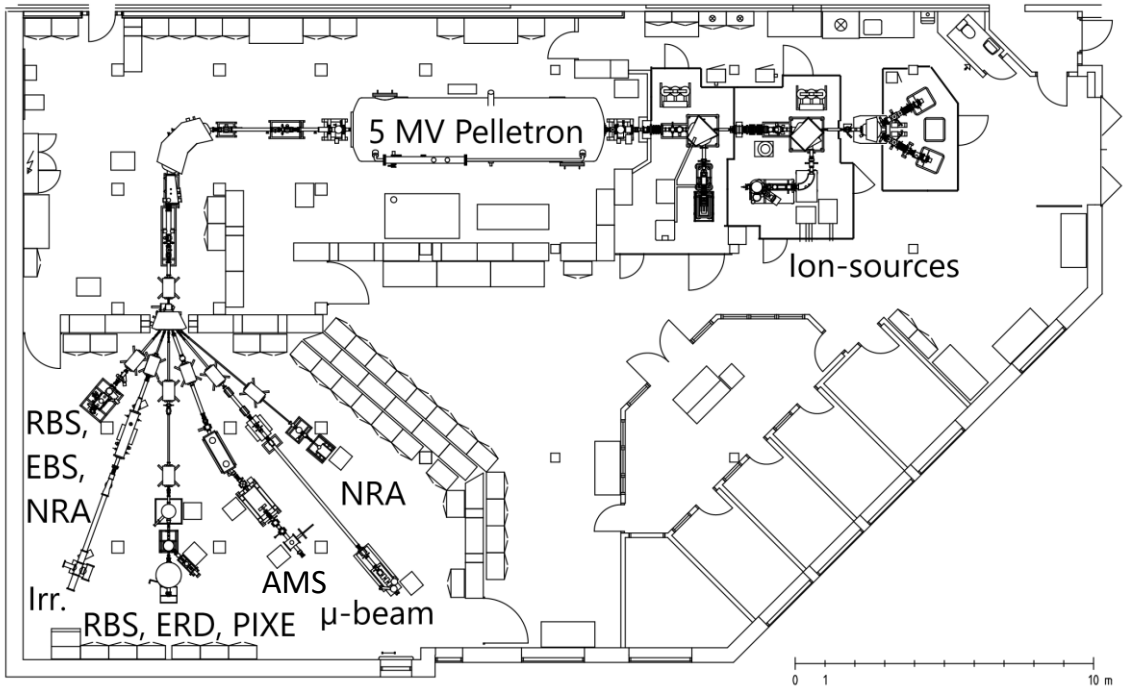
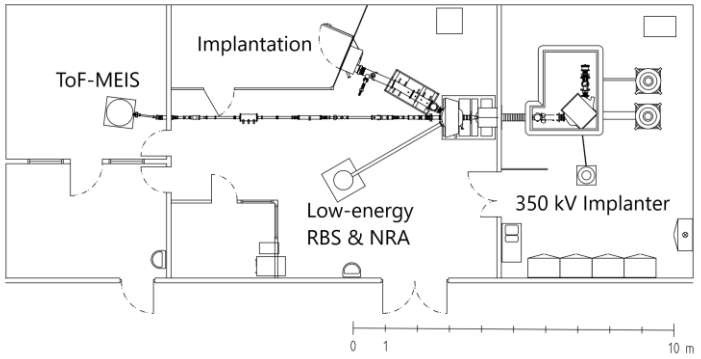
5 MV 15-SDH2 pelletron accelerator



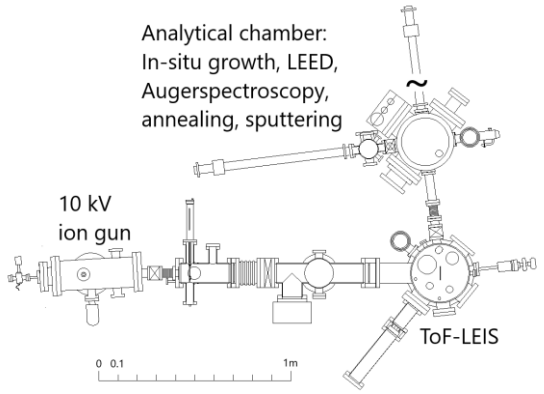
2 gas & 2 sputter ion sources – beams of H, D, ^{3}He, ^{4}He, C, N, O, Cu, Br, I, Au, …

350 kV Danfysik implanter



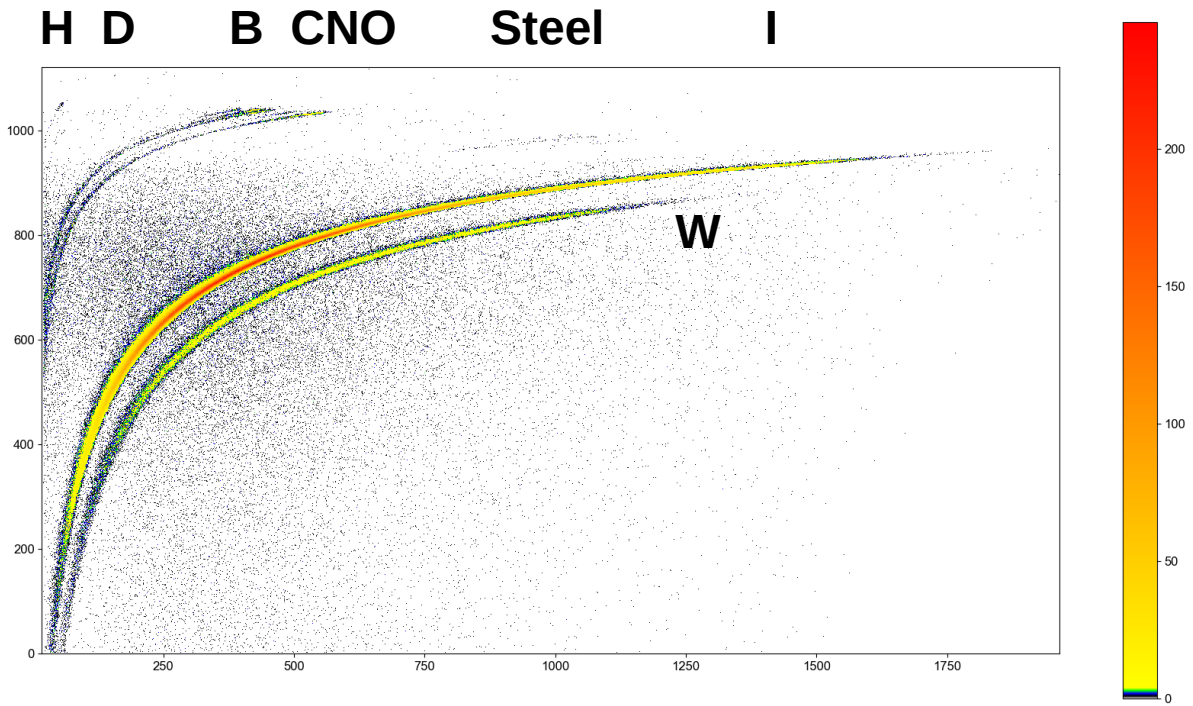
3 interchangeable sources: Gas, oven, sputter

ToF-LEIS system



Example: low-Z characterization

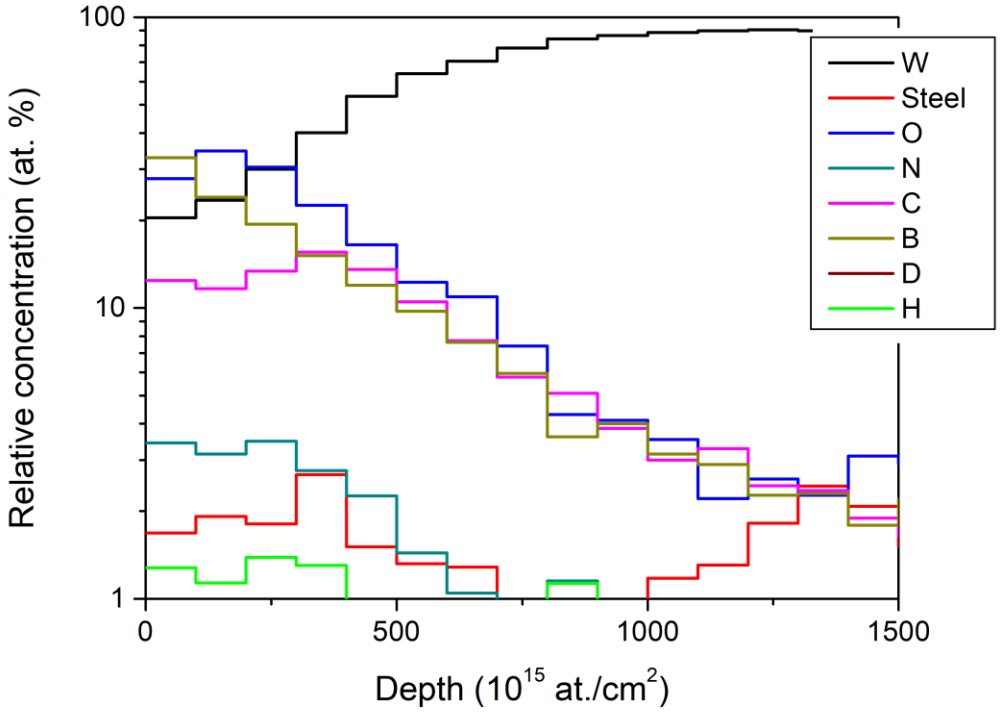
C3 34iC from WEST



ToF-ERDA for multi-element analysis

Example: low-Z characterization

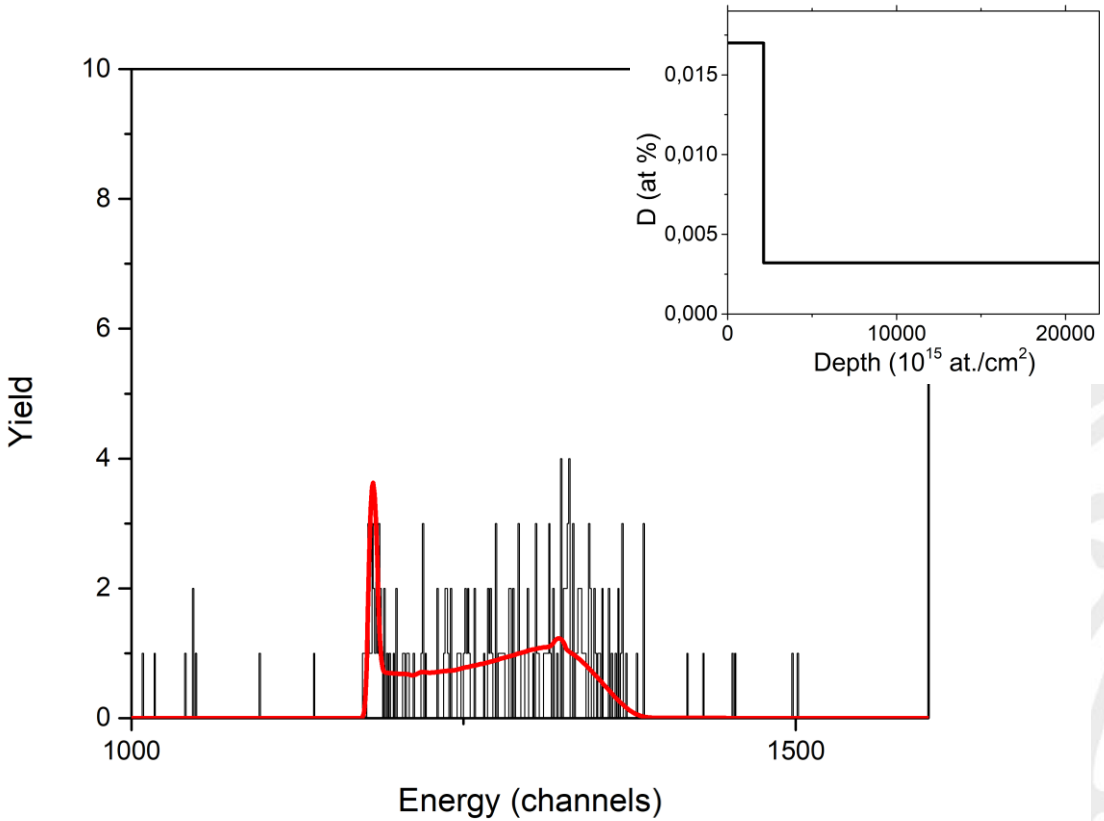
C3 34i from WEST



ToF-ERDA for multi-element analysis – can be complemented by NRA

Example: low-Z characterization

C3 34i from WEST



NRA with 2.8 MeV ^{3}He

Recent developments…

5 MV Pelletron, Uppsala University

In-situ target modification & IBA characterization

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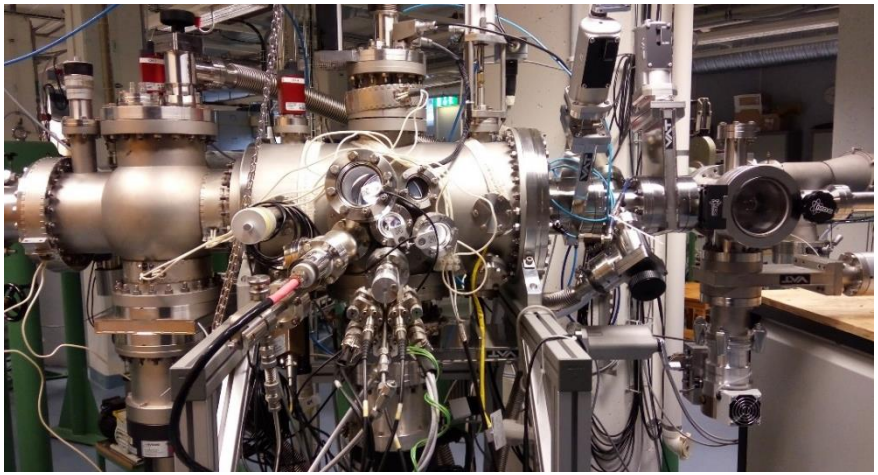
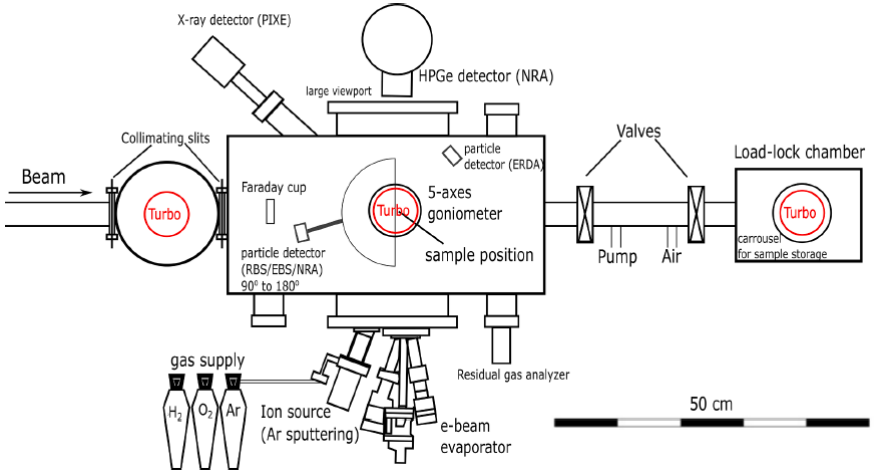




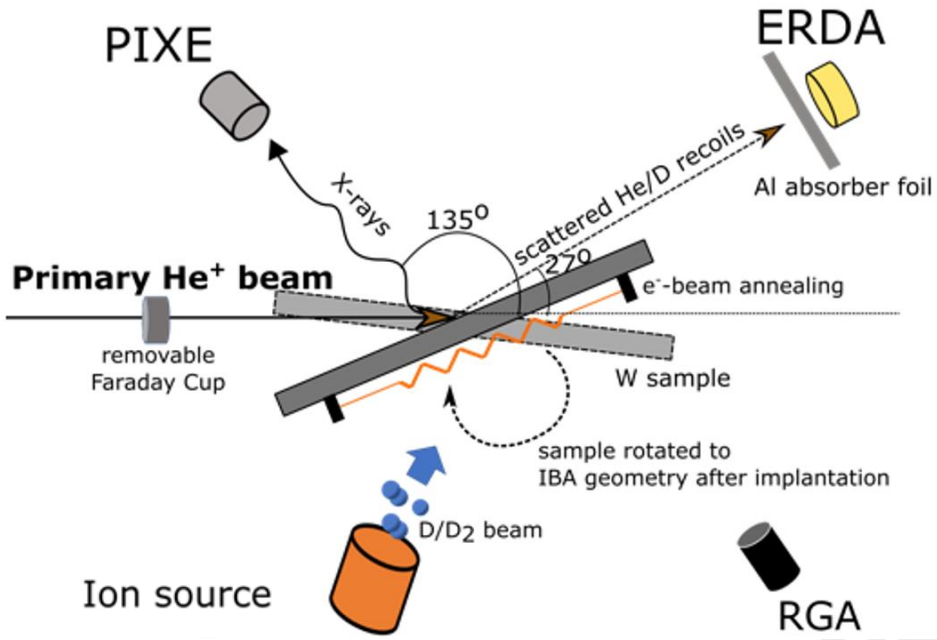
- **UHV-chamber at T6 @ 5MV tandem**
- **Accessible for light and heavy ions**
- **Beam energies from 2 – 50 MeV**
- **Multi-method capabilities**

	RBS/EBS	NRA*	PIGE	ERDA	PIXE	Evaporation	Annealing	Sputtering	Implantation
RBS/EBS									
NRA									
PIGE									
ERDA									
PIXE									
Evaporation									
Annealing									
Sputtering									
Implantation									

K. Kantre et al., Nucl. Instr. Meth. B (2020)

In-situ IBA for fusion-related research

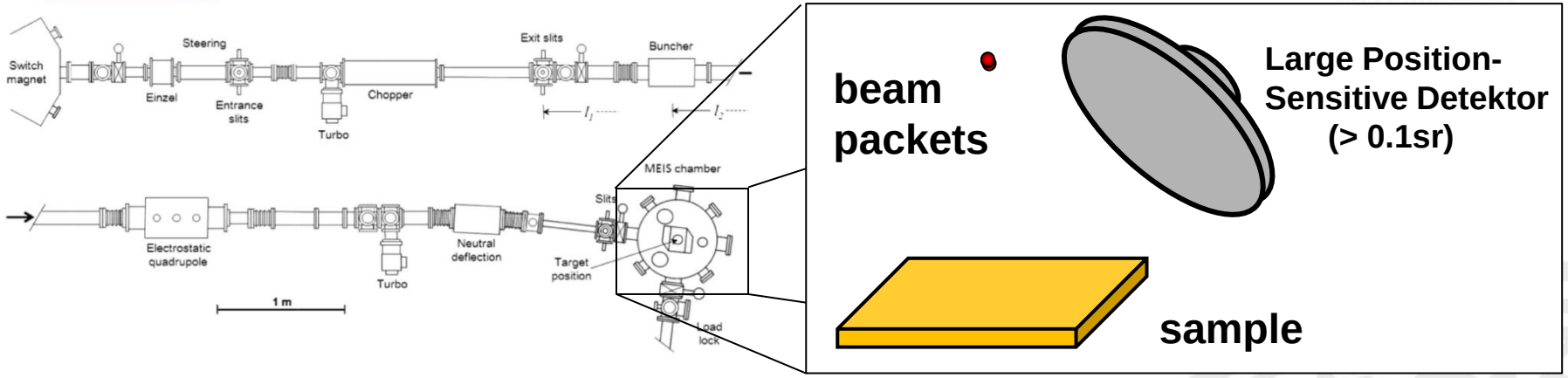
H-implantation and retention



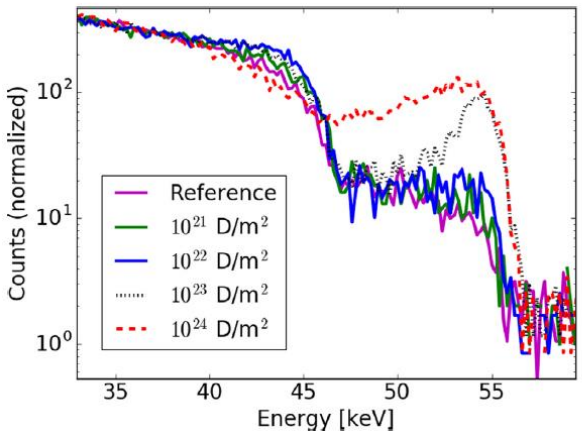
- **Combined *in-situ* D-implantation IBA & TDS experiments**
  - **Implantation to >10^{22}m^{-2} and annealing to >1000 °C**

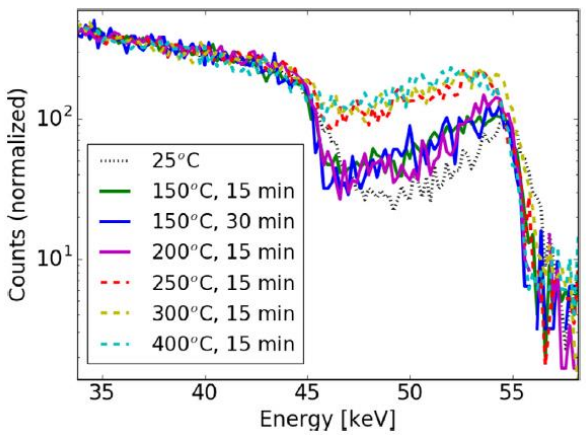
The Uppsala ToF-MEIS system

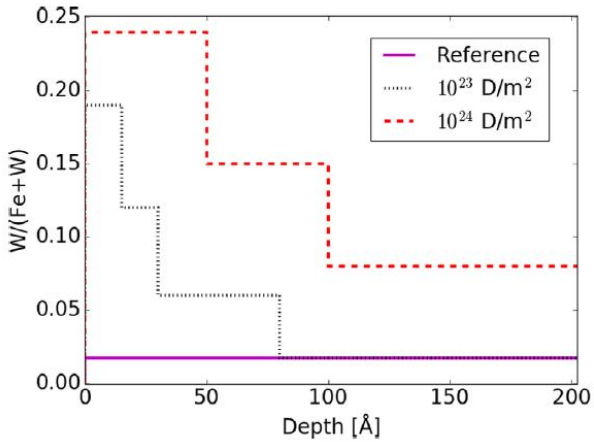
A versatile tool for HR-depth profiling



M. Linnarsson et al., Rev. Sci. Instr. (2012)



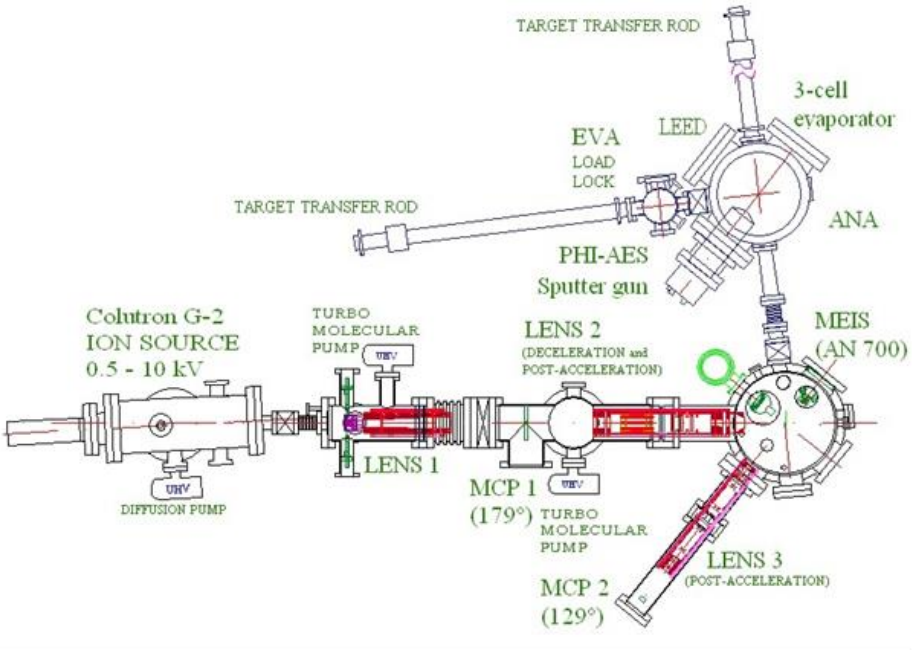


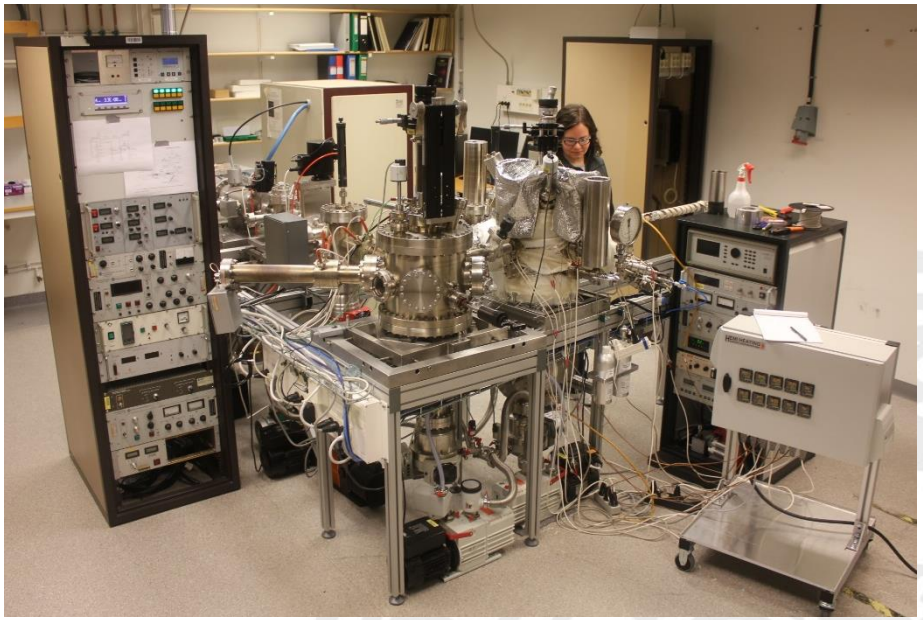


Ström et al., Nucl. Mat. Eng. (2017)

The Uppsala ToF-LEIS system

Surface analysis & in-situ growth and modification





S.N. Markin et al., Vacuum 73 (2004)
S.N. Markin, PhD Thesis JKU Linz (2008)

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Thank you!