Chemistry Experiments behind TASCA

Outline

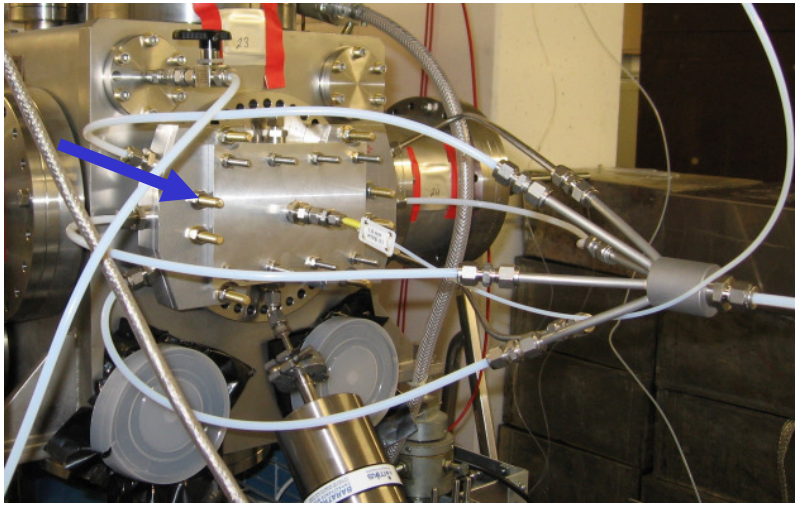
- TASCA – physical preseparator for SHE chemistry
- RTC – chemical TASCA interface
- The gas – jet system
- Test experiments with homologs of SHE
  - studies with Os by electrodeposition and liquid-liquid extraction
  - gas chromatography experiments with Pb, Hg and Rn
- First TAN chemistry- experiment @ TASCA
- E114 chemistry experiment
- Summary and outlook

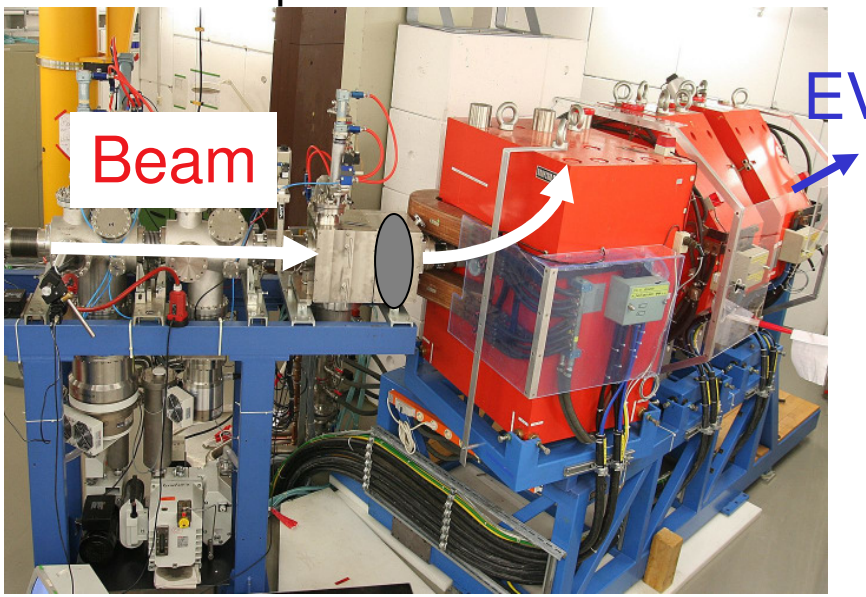
TASCA as a preseparator

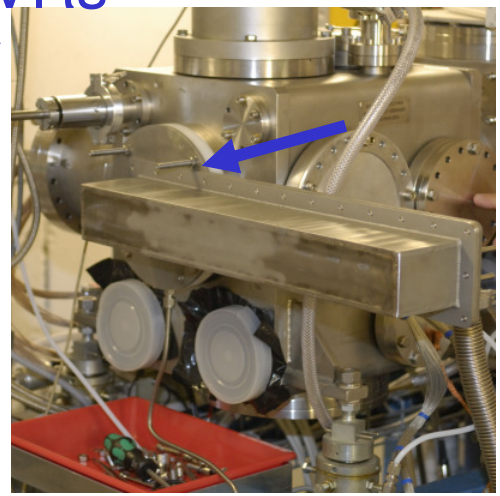
☺TASCA deflects the primary beam and suppresses background from the products of transfer reactions

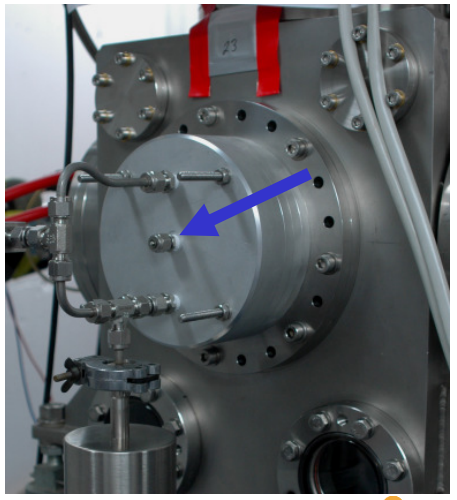
☺EVRs can be easily stopped in a gas and transported to a chemical or detection device

☹Image size at TASCA exit is much larger than beam spot





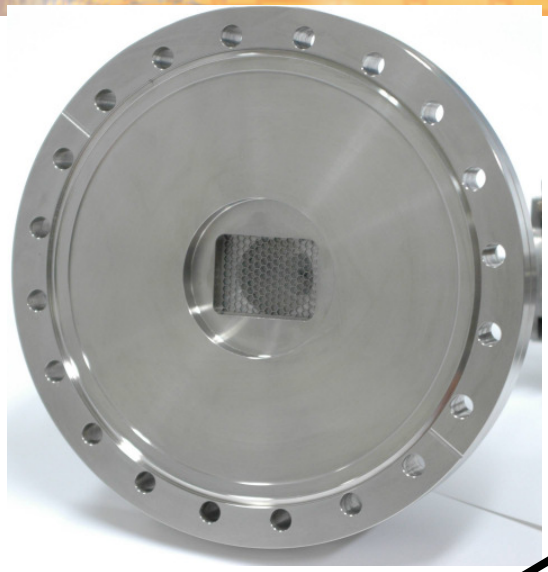


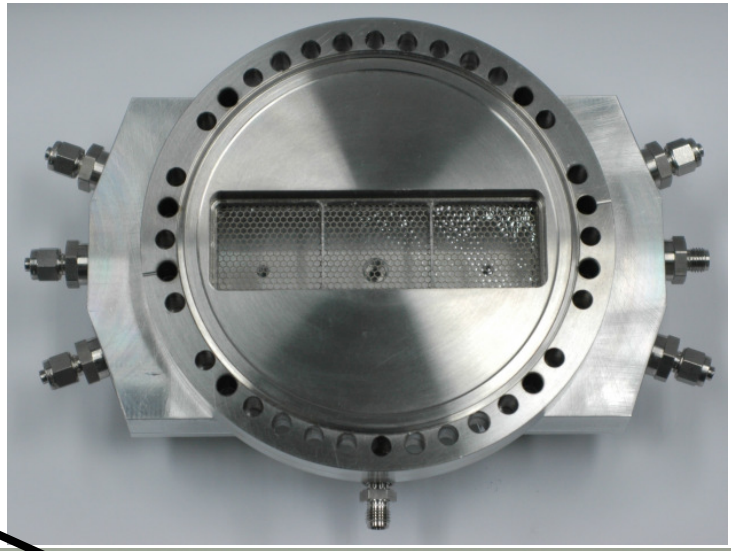


Two ion-optical modes – two RTC designs

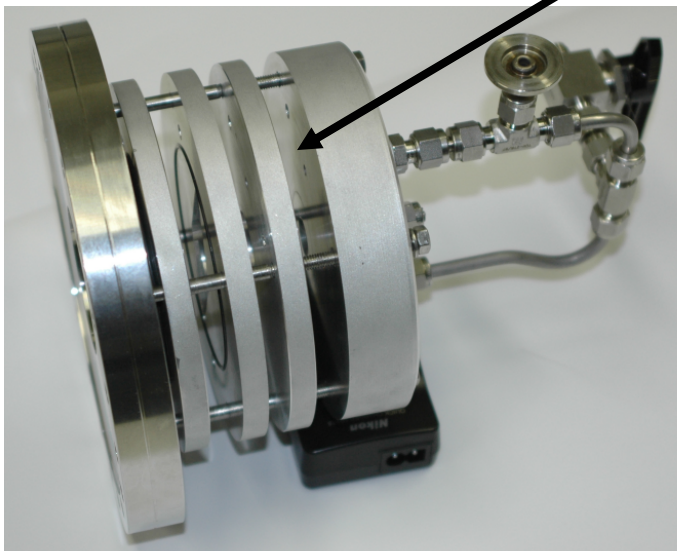
SIM

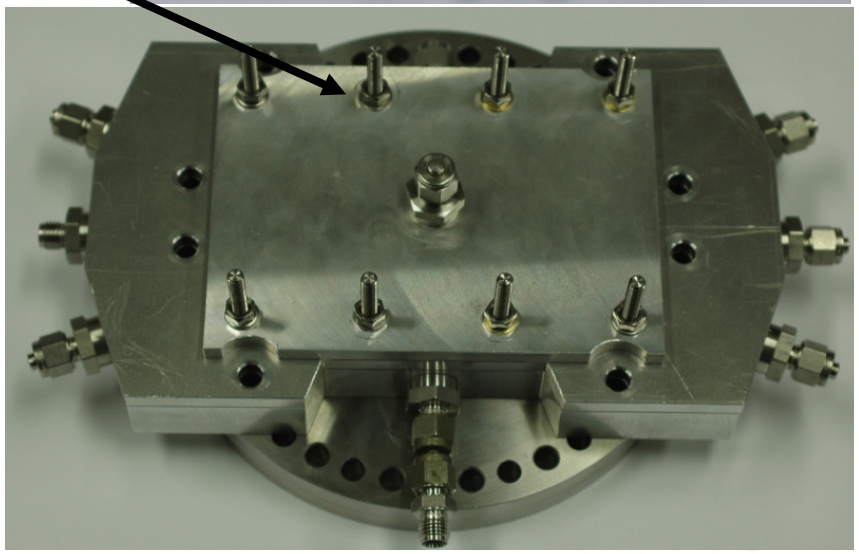
HTM



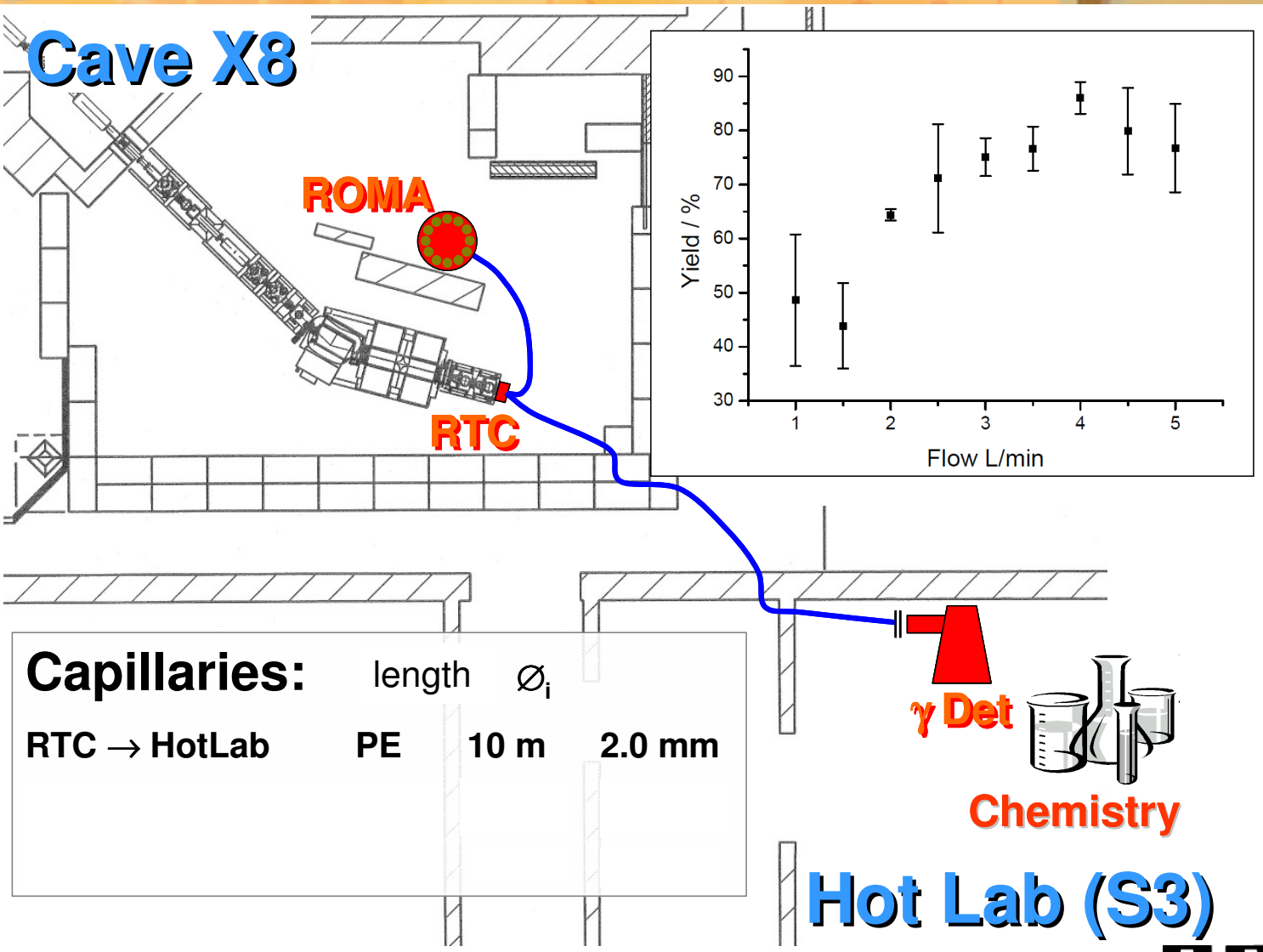


Modular desingn
for an optimal
stopping in gas



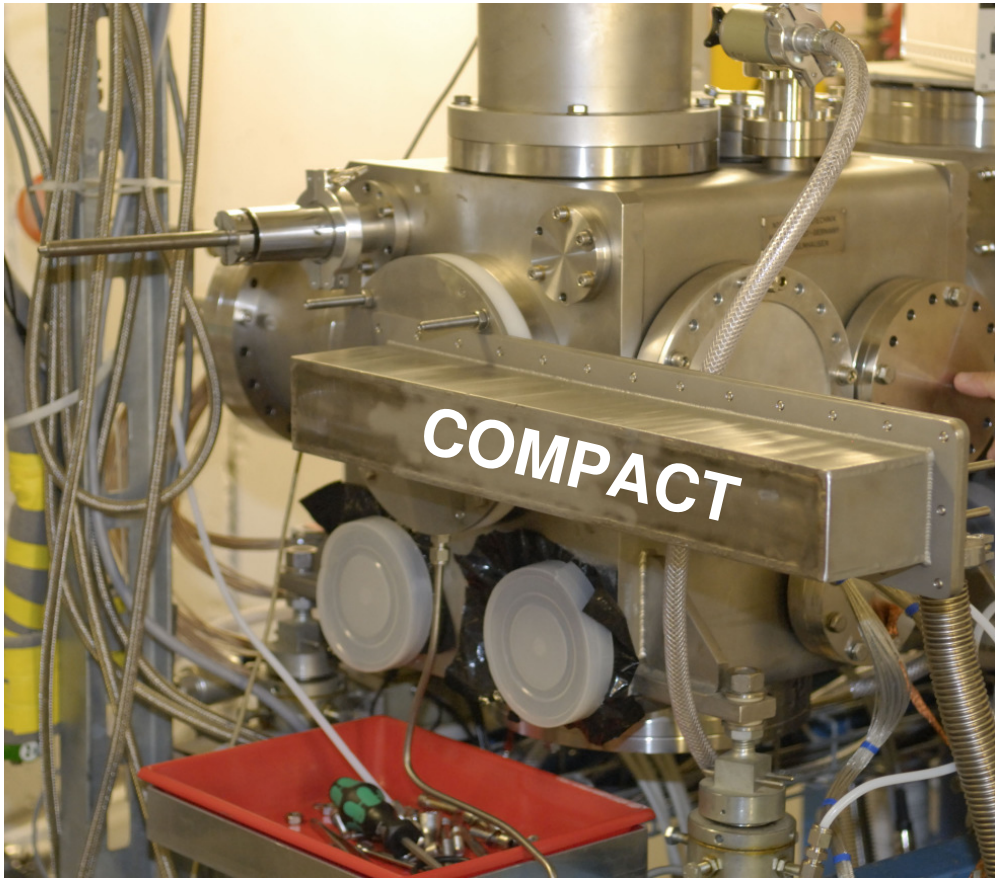


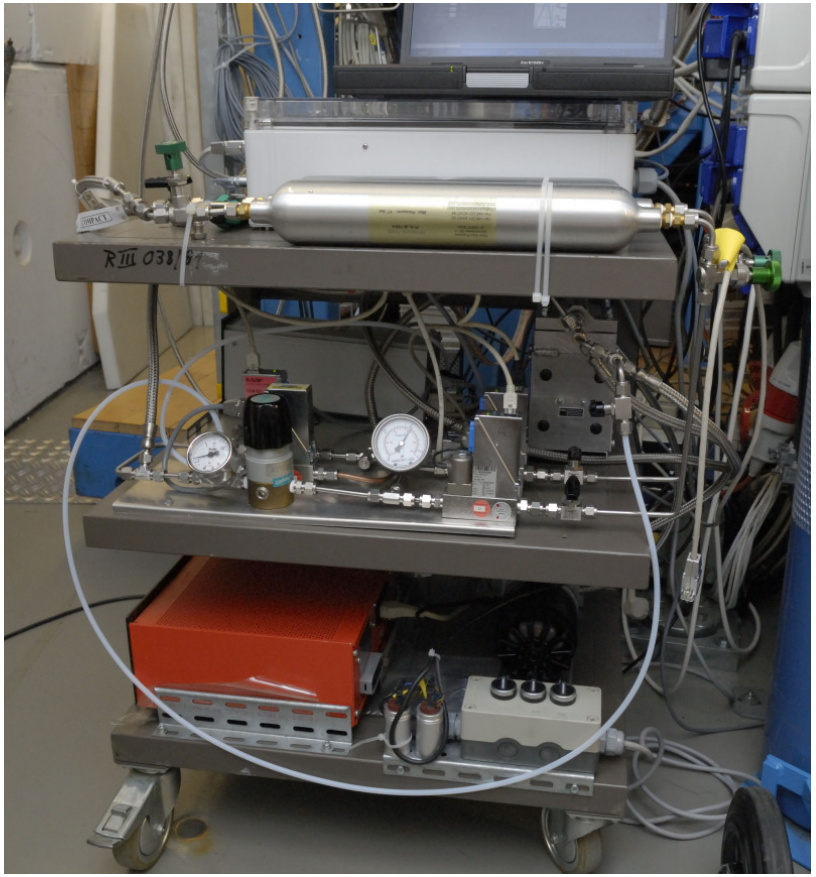
Gas-jet system



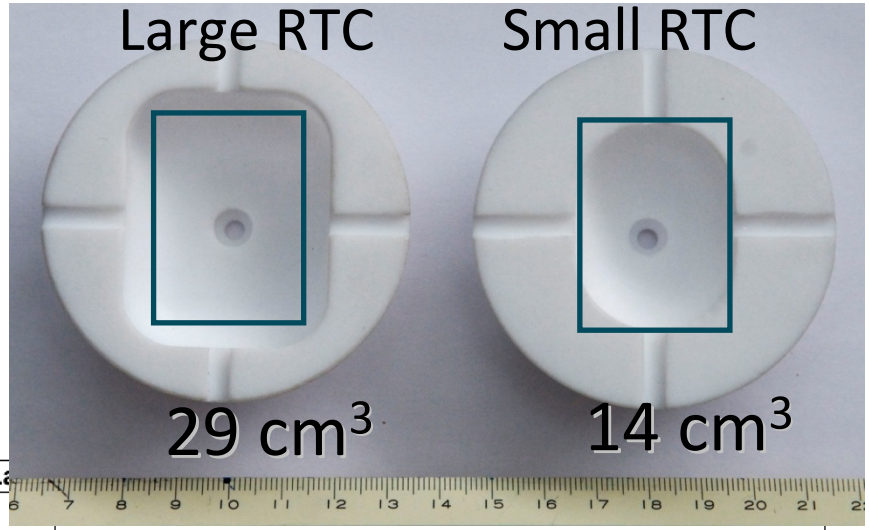
Capillaries:		length	$\varnothing_i$
RTC → HotLab	PE	10 m	2.0 mm

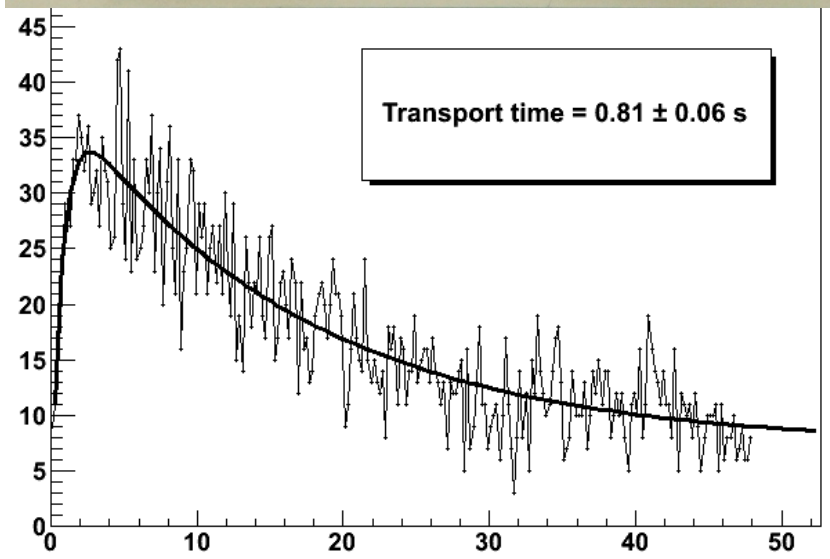
Direct TASCA-chemistry connection



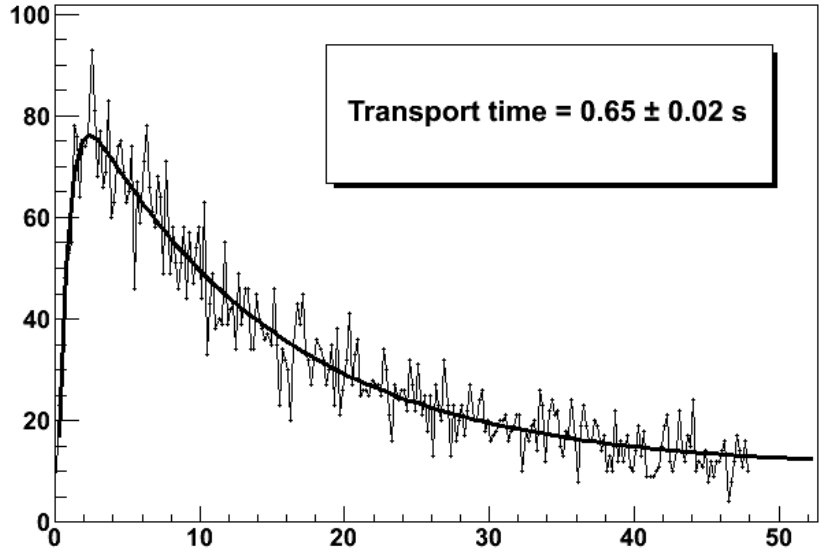


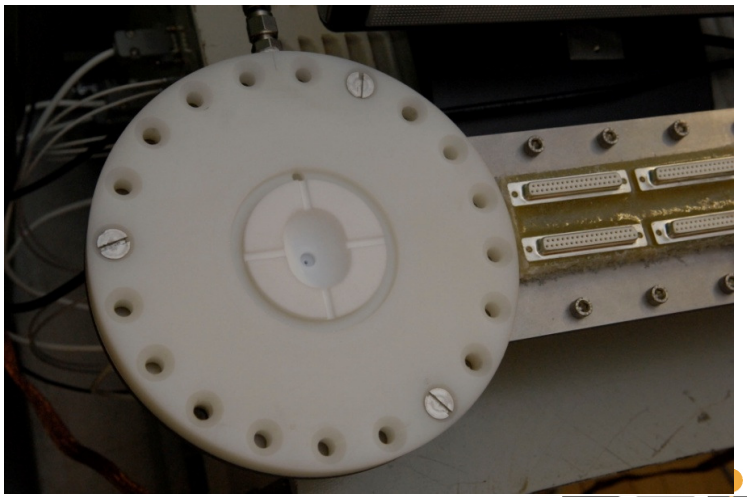
Gas loop


Large RTC
Small RTC
29 cm3
14 cm3

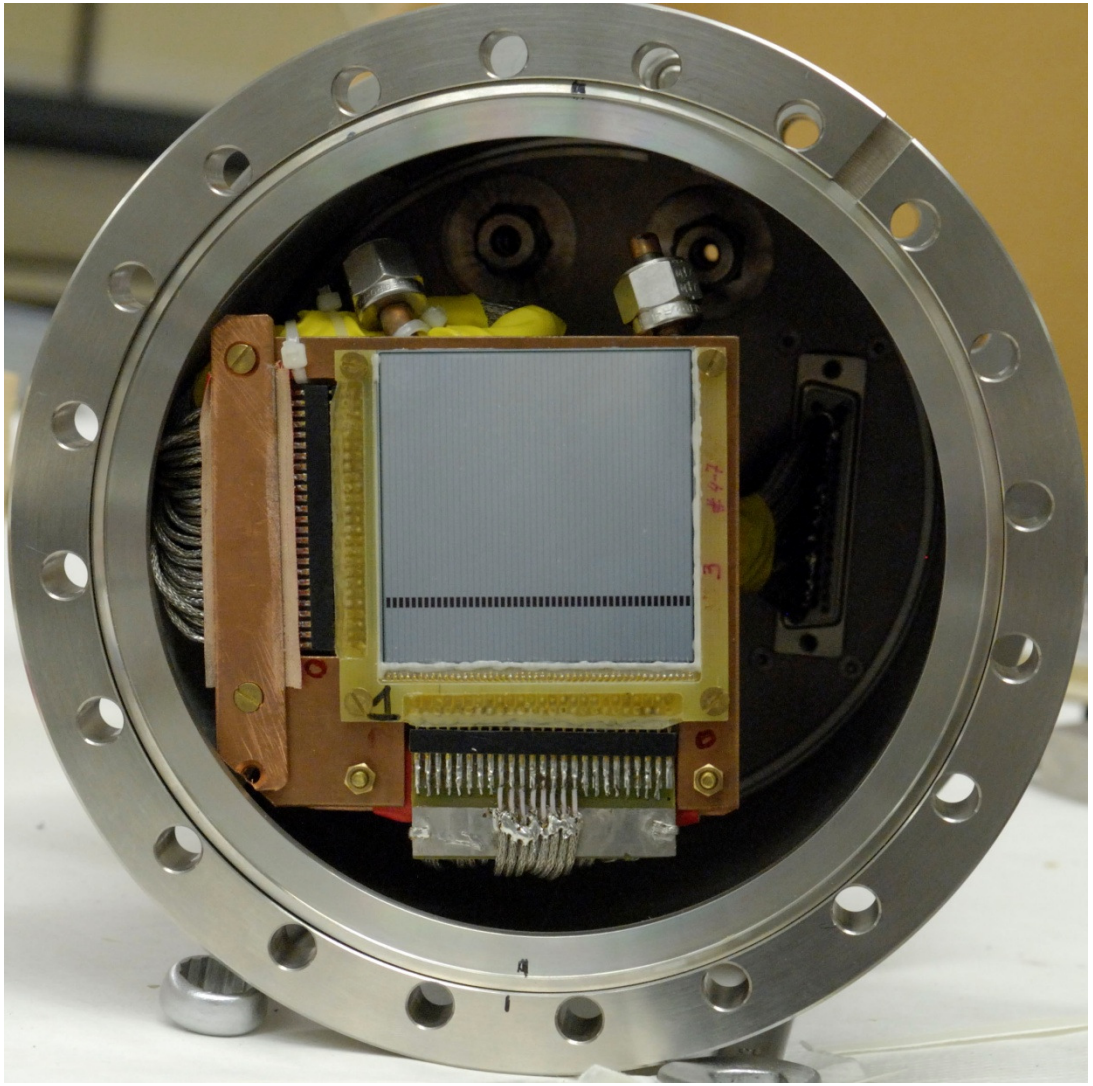

Transport time = 0.81 ± 0.06 s

Small RTC

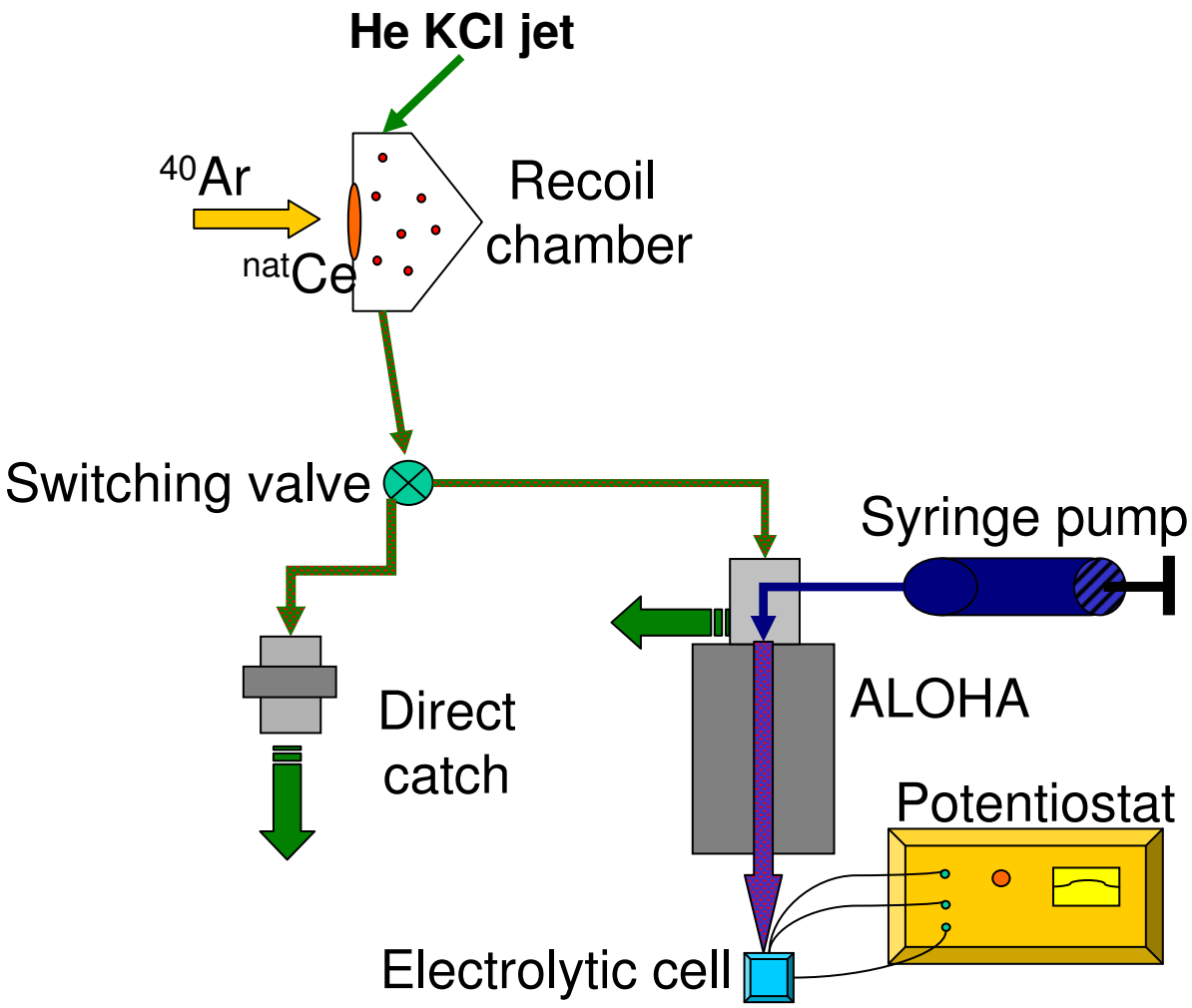

Transport time = 0.65 ± 0.02 s



RTC yield optimization using DSSSD

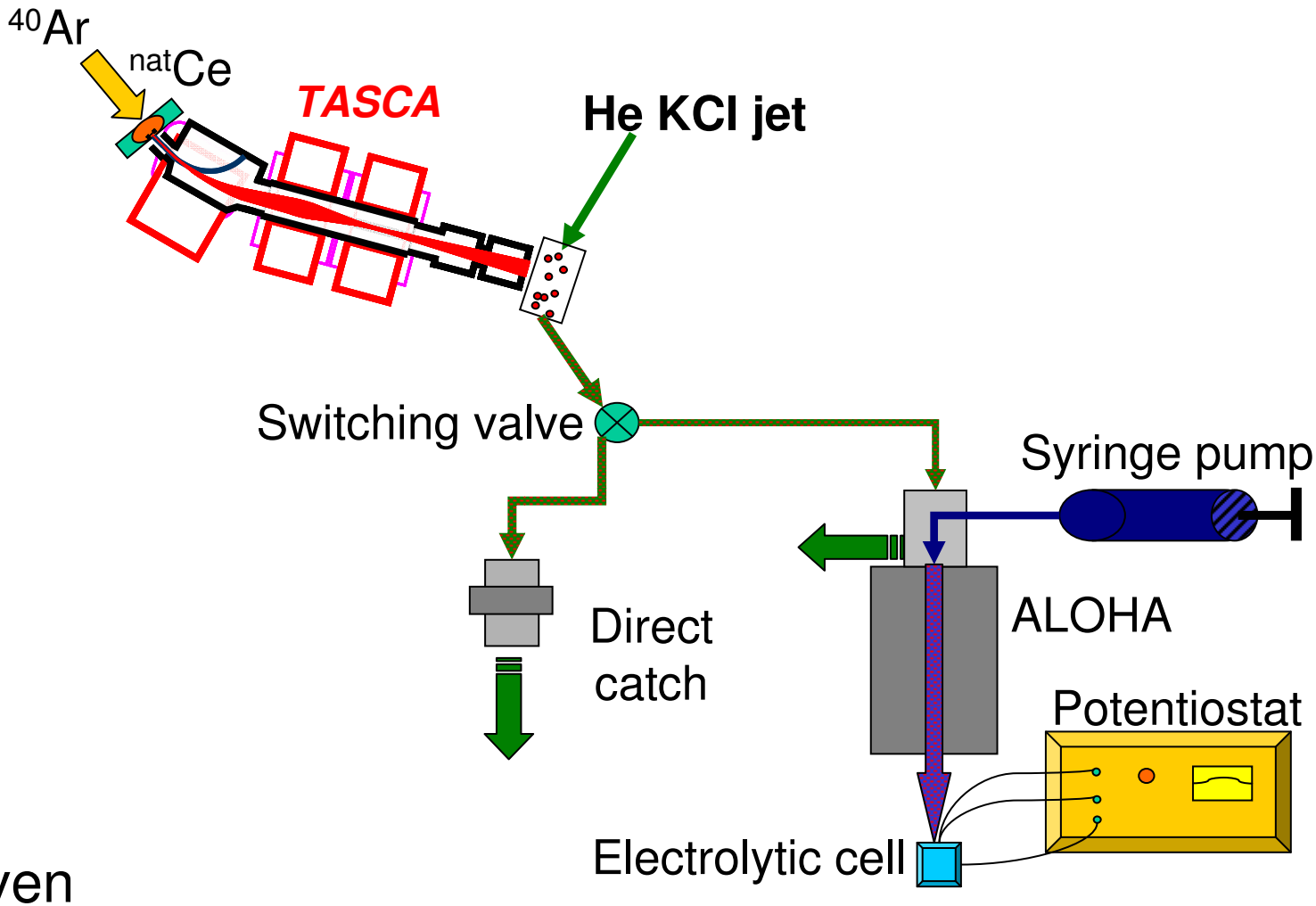


Experiments with Os at TASCA



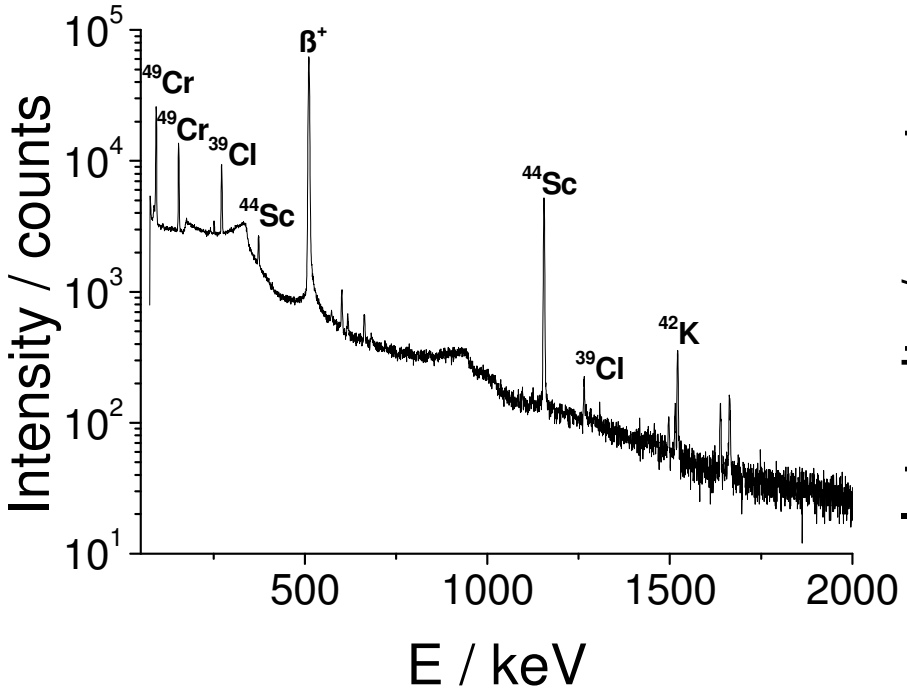
J. Even

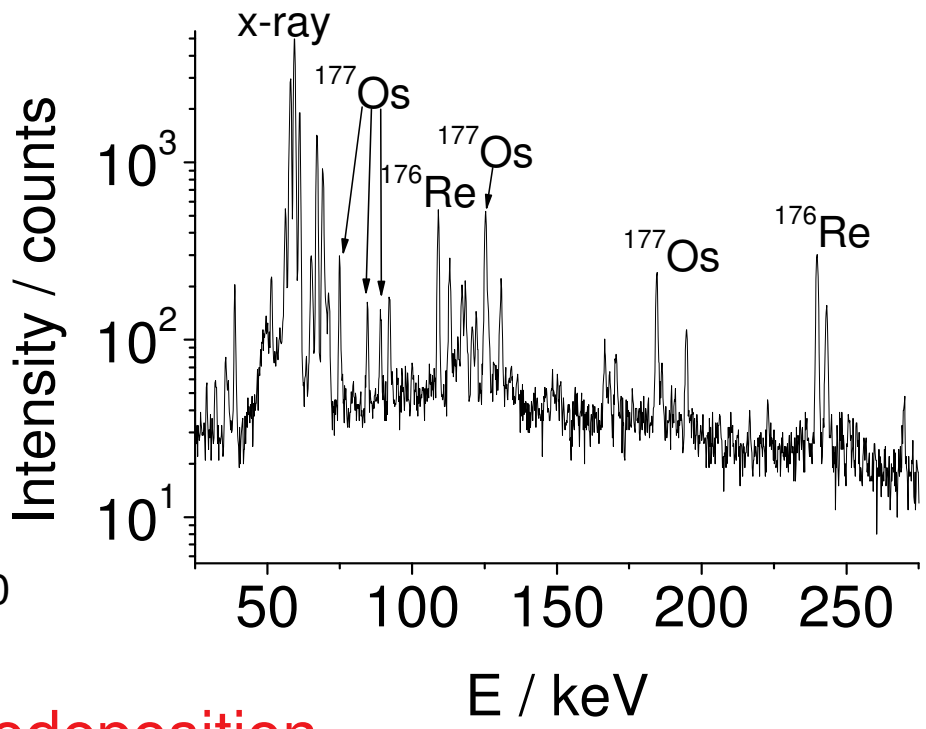
Experiments with Os at TASCA



J. Even

Suppression of unwanted products



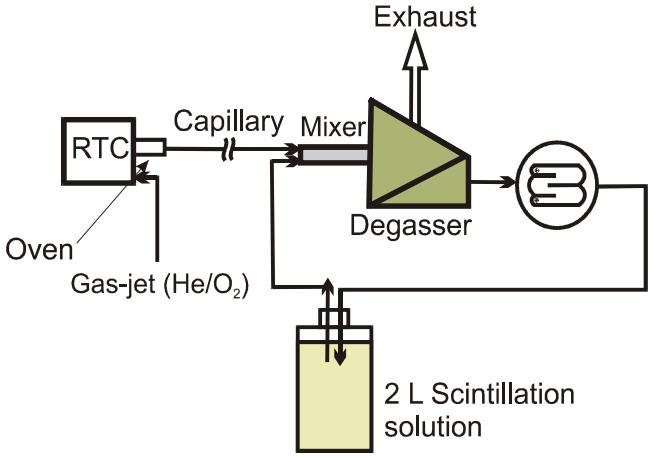


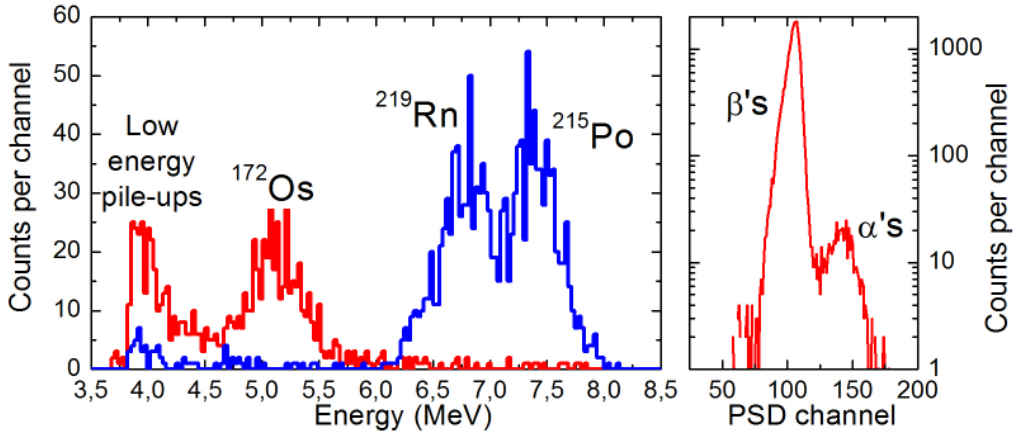
Os electrodeposition

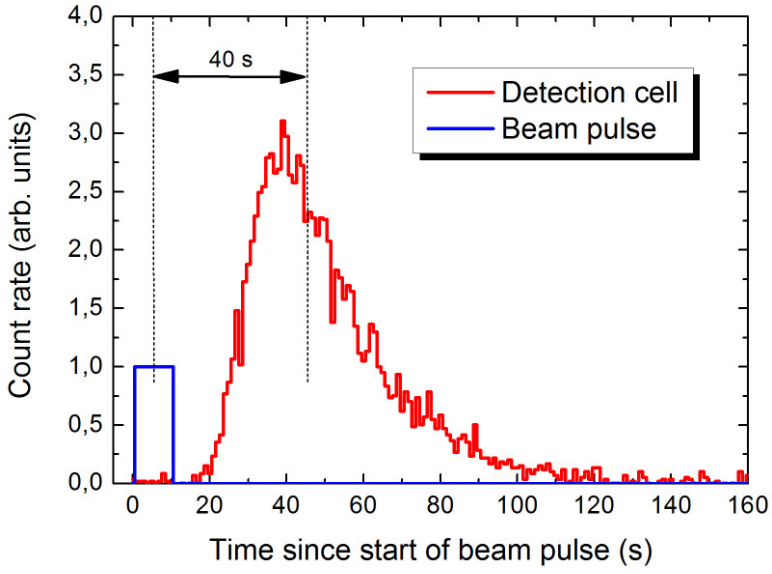
J. Even without TASCA

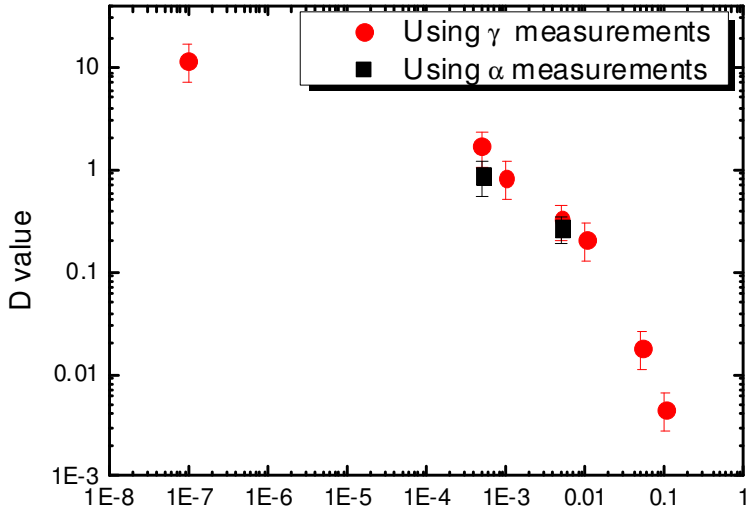
with TASCA

SISAK experiment with ^{172}Os at TASCA



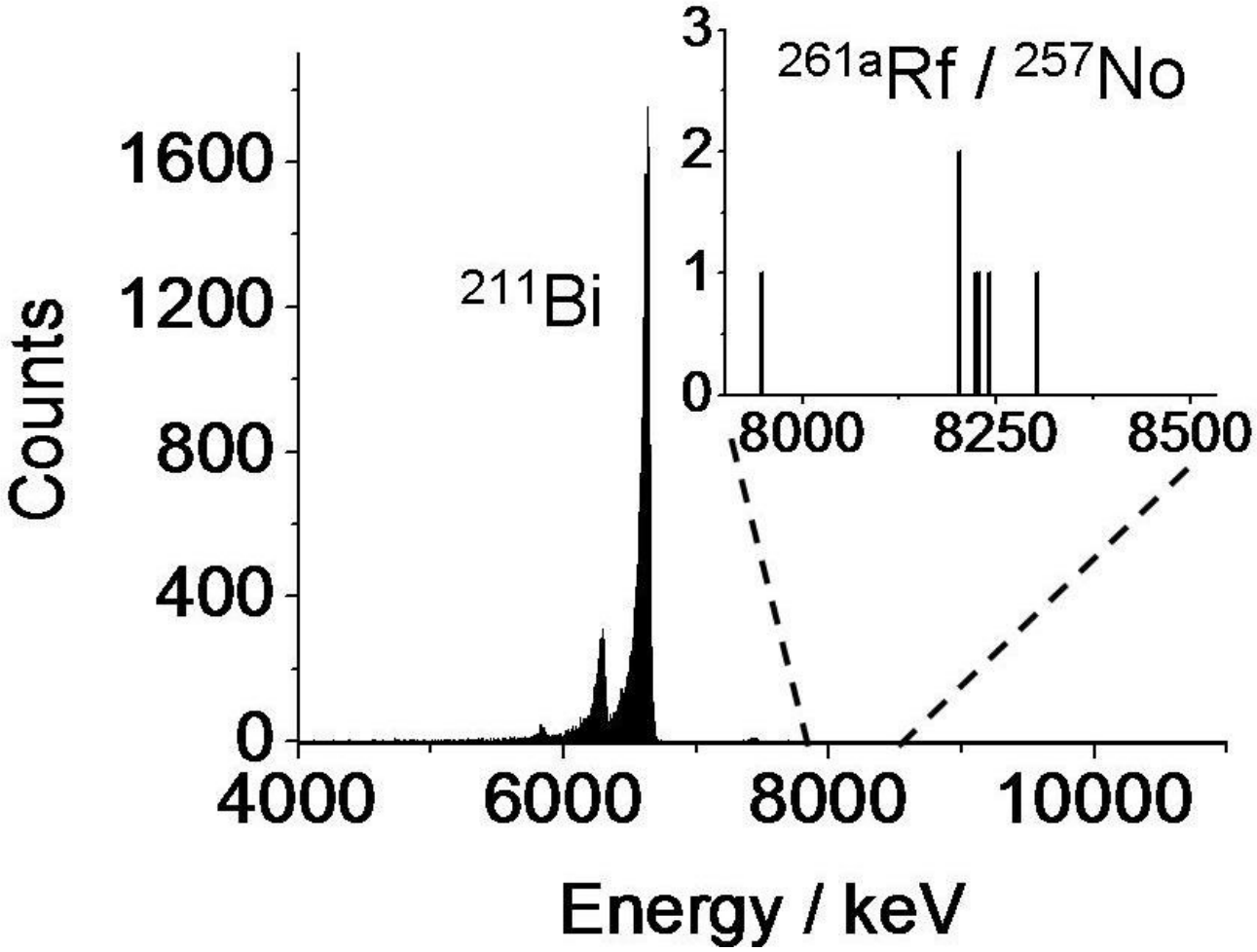






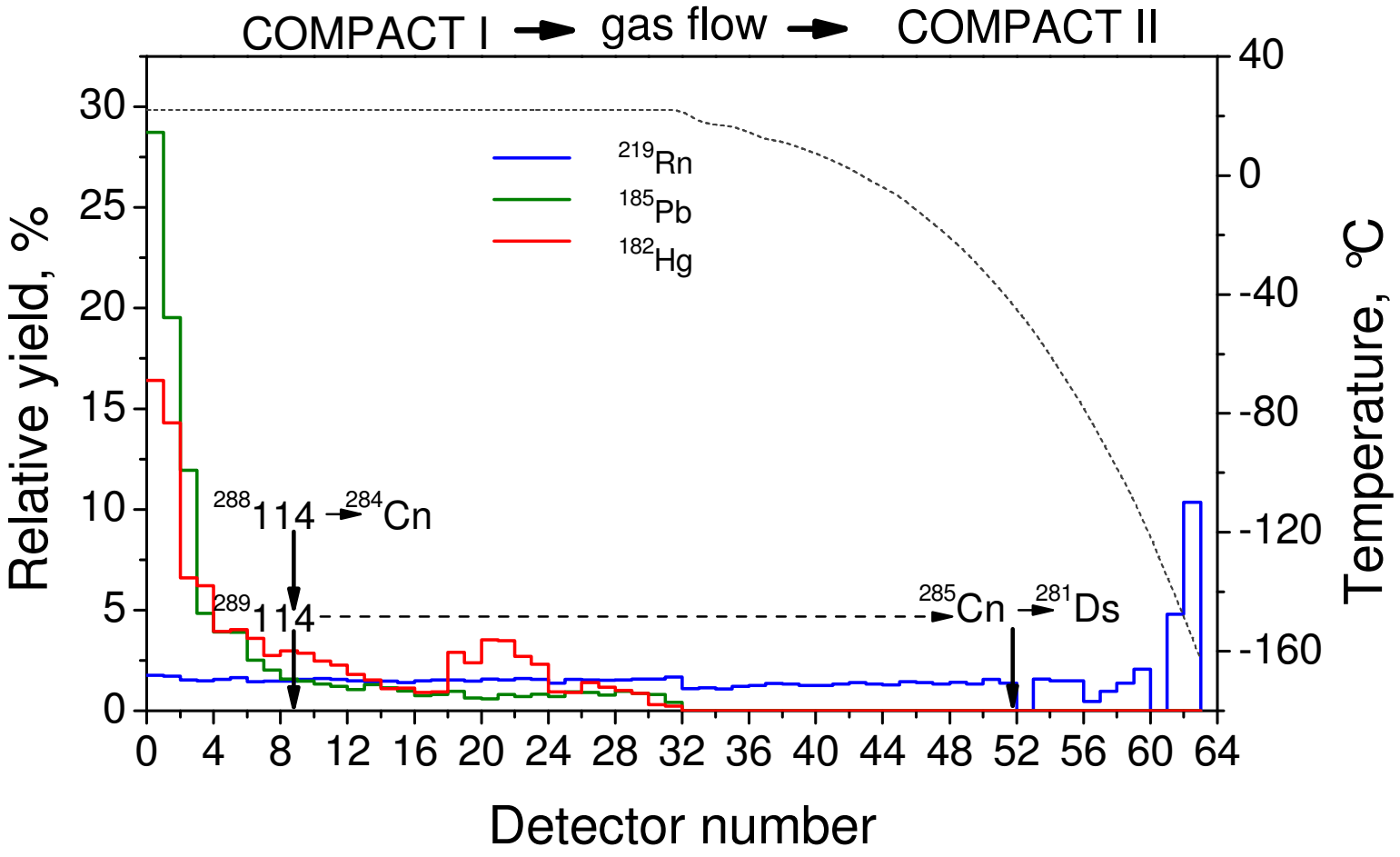
F. Samadani

The first SHE chemistry experiment at TASCA



- Jet yield 50% compared to ROMA
- 7 events, all observed within the second fractions
- chemical yield 30%
- %ads ≥ 67.1 % in 7x10−4 M HF
- %ads ≥ 74.5 % in 1x10−3 M HF.

E114 Experiment at TASCA

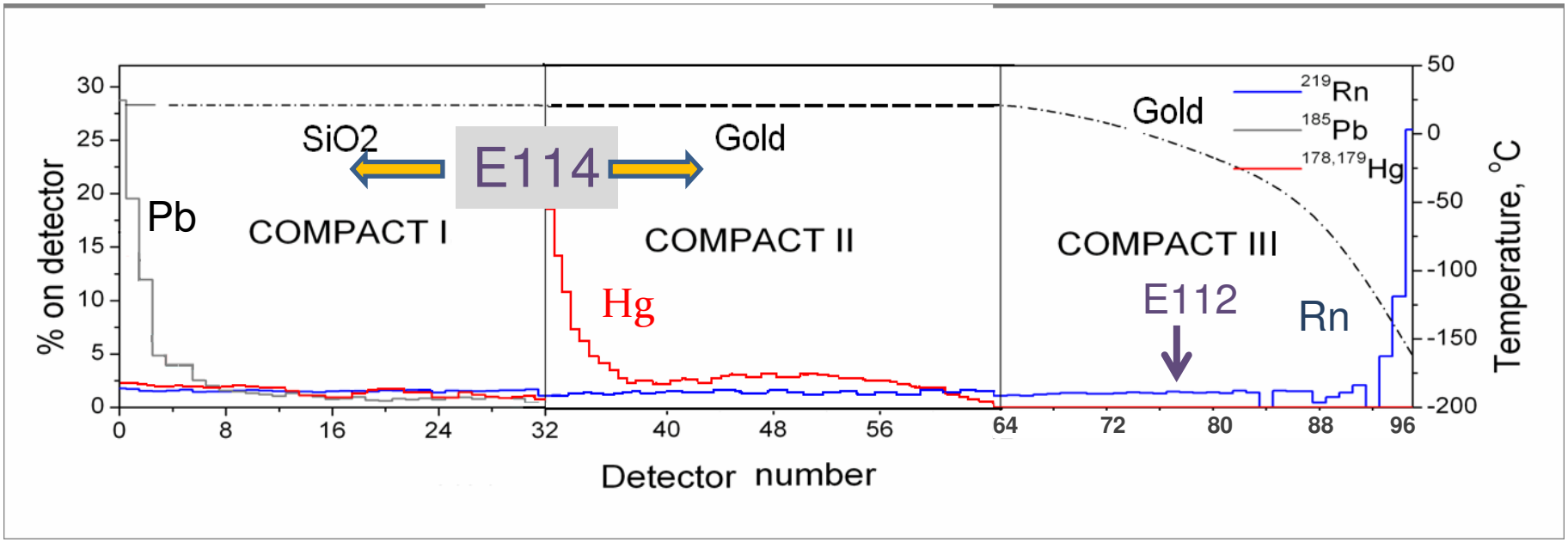


Counting rate (8-12 MeV) 2.5E-2 1/s in all 128 diodes

Next E114 experiment in 2011

Proposal U259:
Comparative chemical study of E114 and E112 with their lighter homologs Hg and Pb

Approved beam time: 15 shifts (main beam 20<A<70)
100 shifts (main beam ^{48}Ca)*



Summary

- TASCA chemical interface has been tested for both ion-optical modes
- Test experiments with Os have demonstrated a very good background suppression from unwanted products by pre-separation with TASCA
- ARCA experiment with ^{261}Rf was performed in 2008
- E114 adsorption on gold was measured at the low-background level in 2009
- The second E114 experiment is scheduled for 2011
- Ongoing developments of gas phase experiments with SHE