

Fundamentals of the future gas stopping cell for online measurements behind TASCA

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TASCA 15

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Recoil Separator for Superheavy Element Chemistry



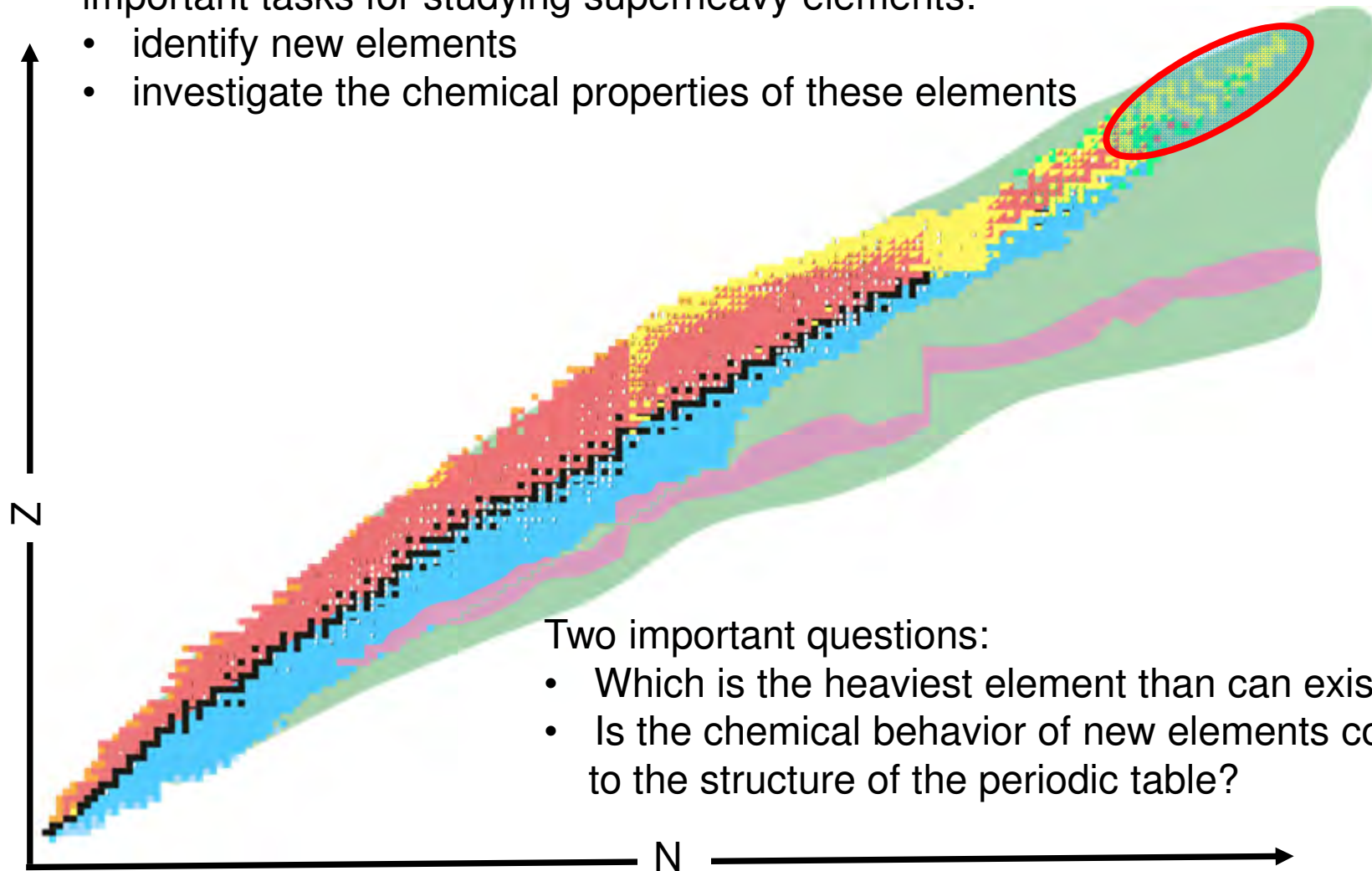
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Motivation

important tasks for studying superheavy elements:

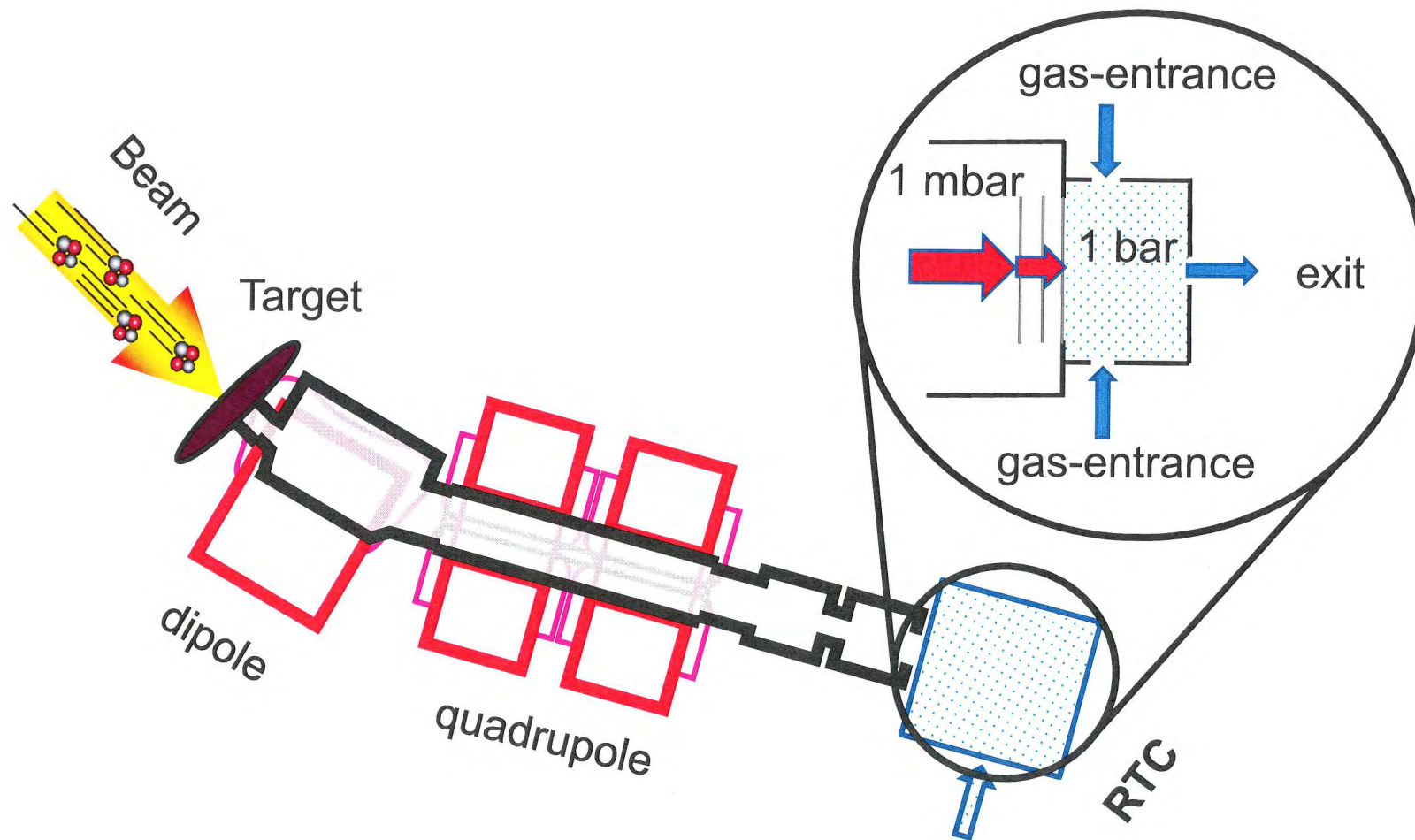
- identify new elements
- investigate the chemical properties of these elements



Two important questions:

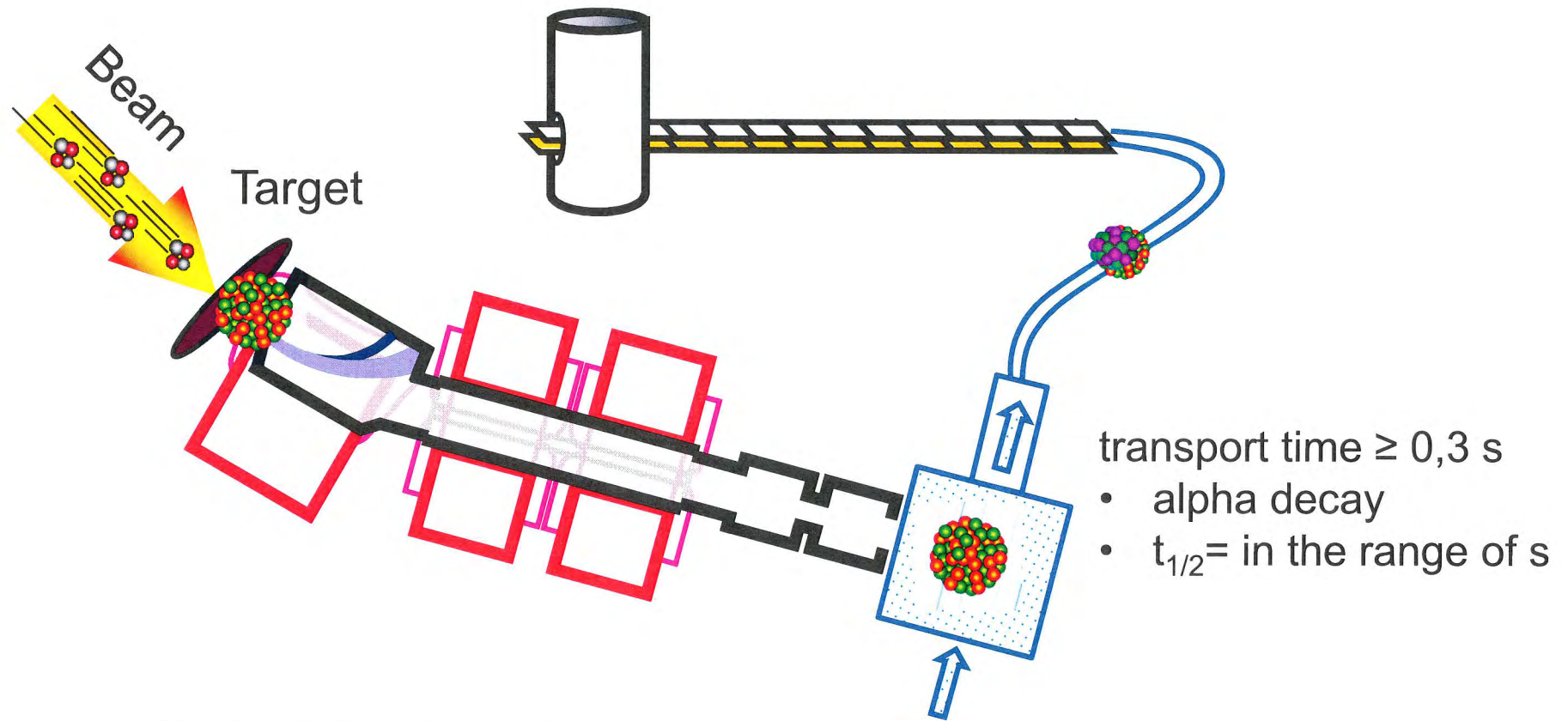
- Which is the heaviest element than can exist?
- Is the chemical behavior of new elements confirming to the structure of the periodic table?

TASCA



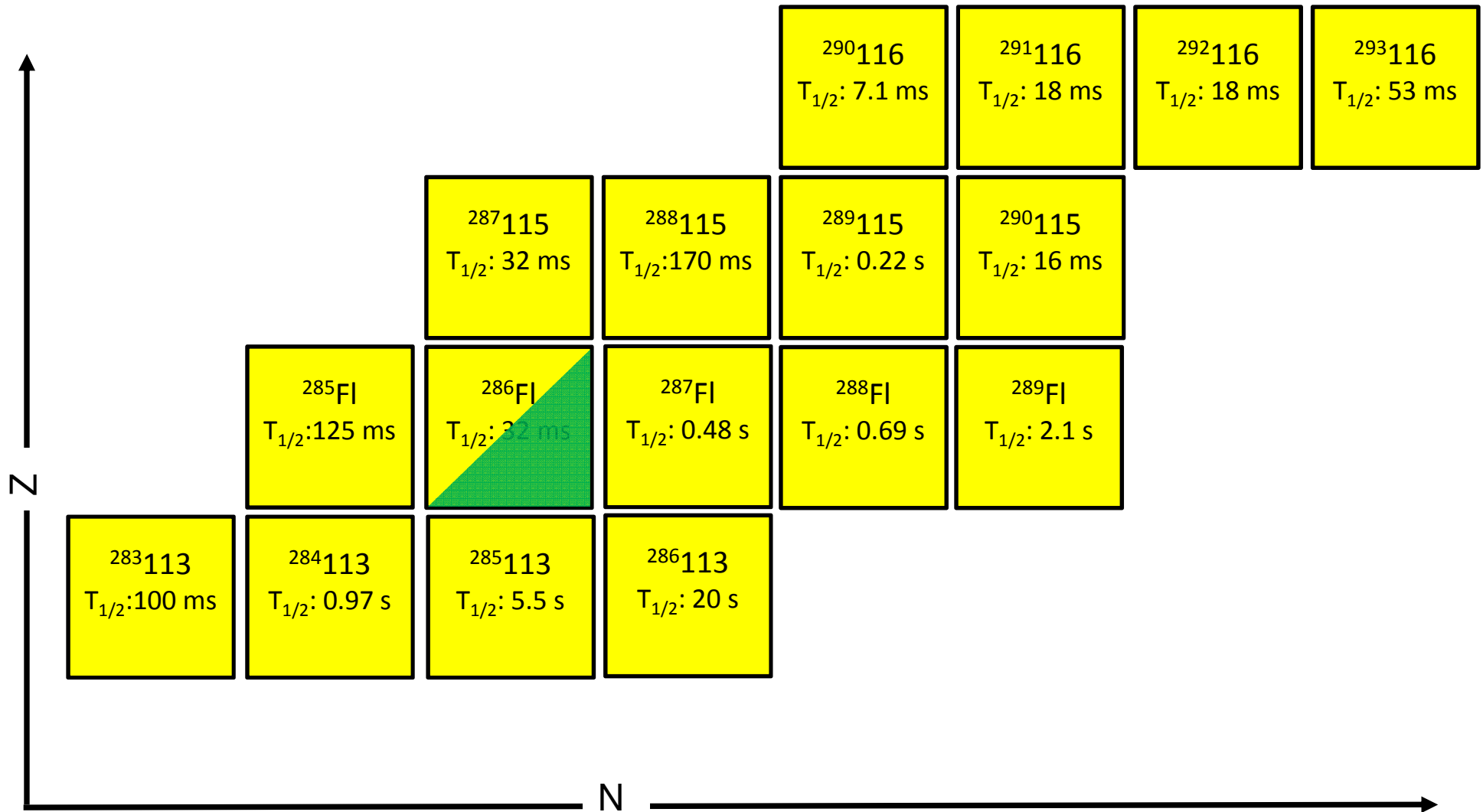
TASCA @ GSI
TransActinide Separator and Chemistry Apparatus

TASCA



TASCA @ GSI
TransActinide Separator and Chemistry Apparatus

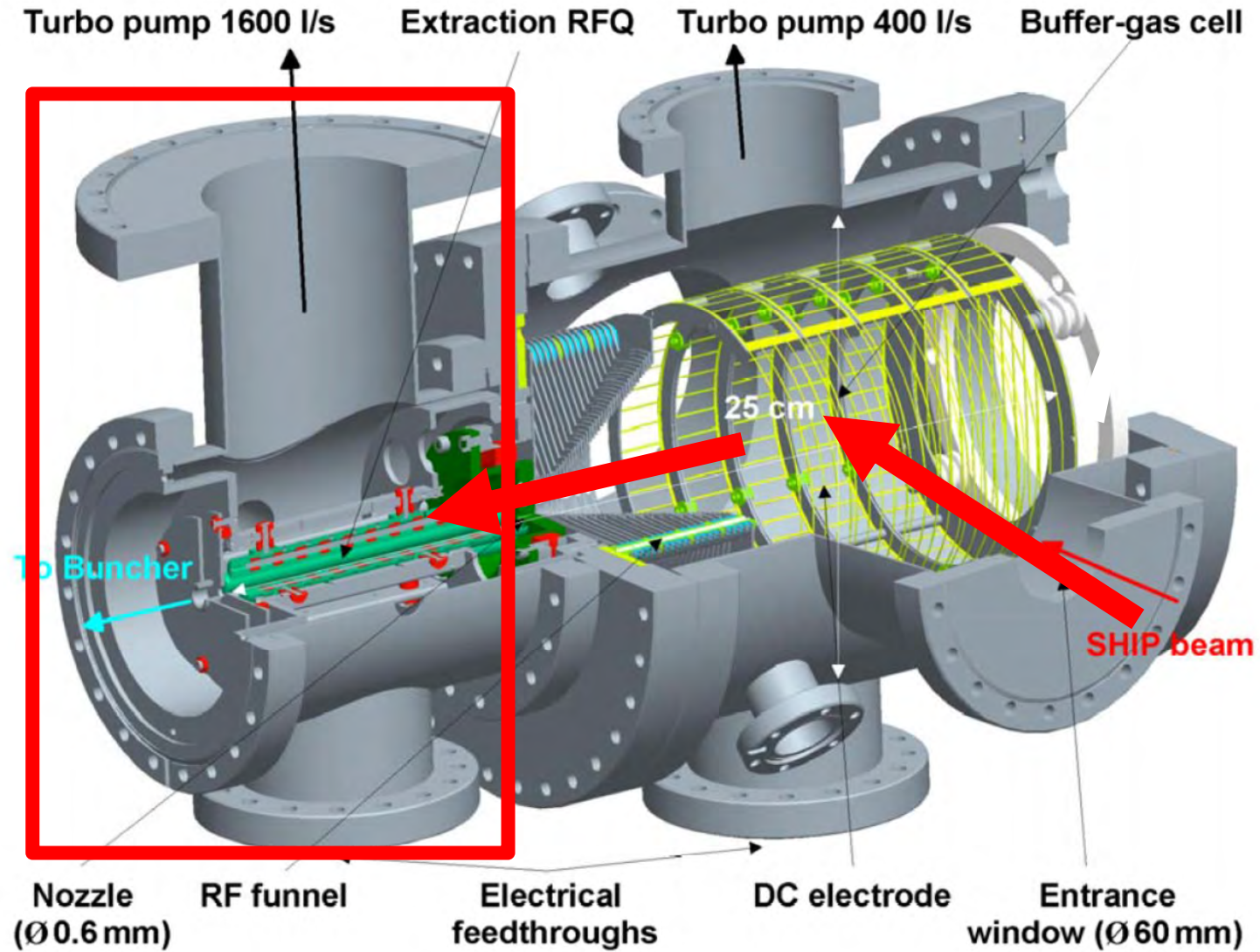
Chemistry beyond flerovium



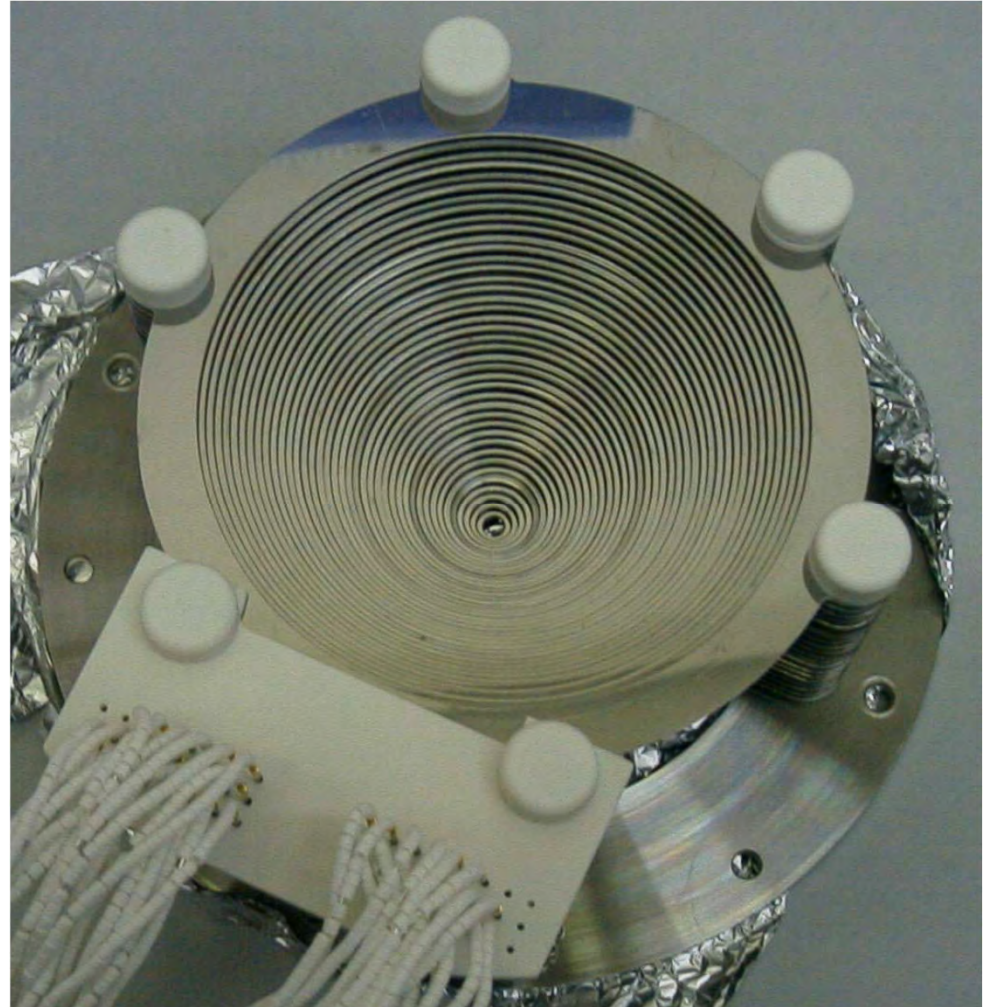
Increase transport yield

- Modify the current RTC ↔ COMPACT Design
 - Decrease volume of the RTC
 - Optimize EVR spot size
 - Increase gas stopping power (He/Ar mixture)
 - Degraded foil
 - Short transport line
 - Closer to the separator
- New Design of the RTC
 - Extraction with electric fields

New gas stopping cell



New gas stopping cell



New gas stopping cell

Only gas flow:

- Ions are stopped in the center of the cell
- Extraction time 1.5 s at 50 mbar (buffer gas)
- 15 min for complete replacement of the buffer gas

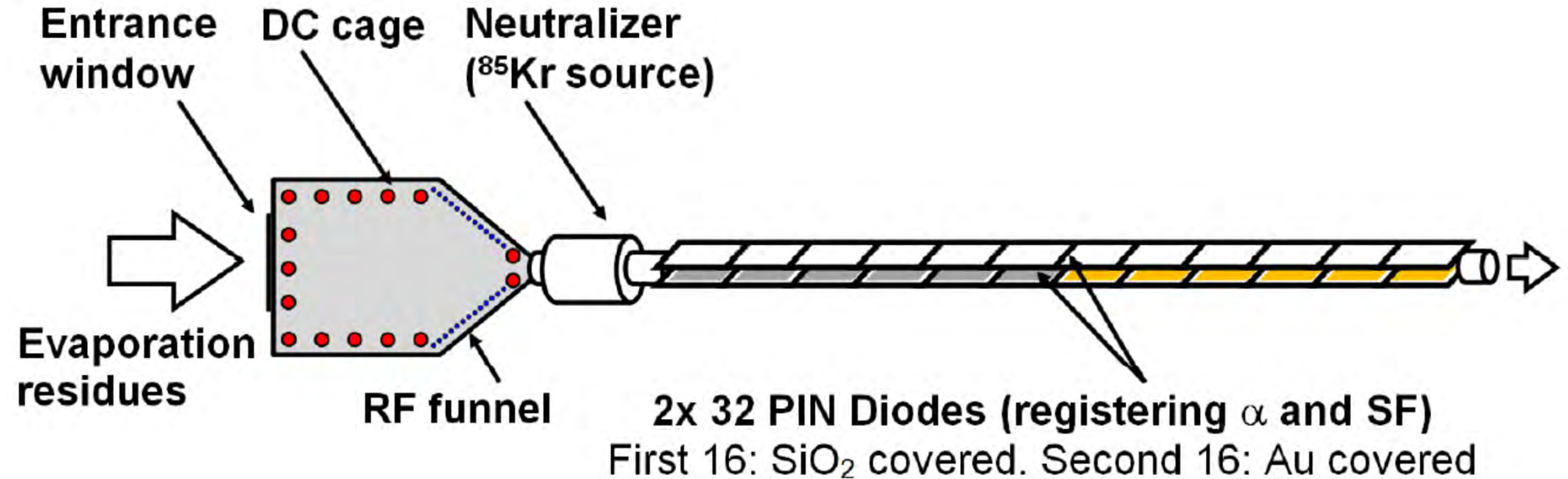
With electric fields

- Extraction time in the low double-digit millisecond range

Requirements for the interface

- Short transport line
- no loss of ions/atoms
 - no adsorption on the walls
- slight change in the flow profile
- Gas flow of 1 L/min
- convert the ions into neutral atoms

Proposed gas catcher – COMPACT setup



Summary

- Decay in flight (114) and short half-life (115 and 116)
 - Transport time to high with the current RTC
 - Faster technique is needed
- A new gas cell with electric fields can realize this
 - Faster extraction times
 - Old: several hundred milliseconds
 - New: low double-digit millisecond range

Thank you for your attention