

University of Groningen

## Ion-extraction from the CISE gas catcher

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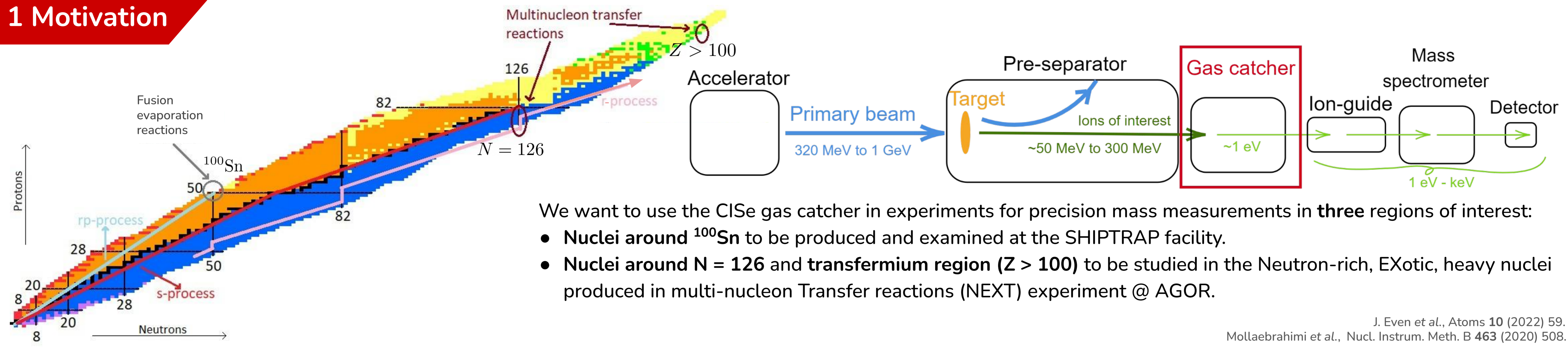
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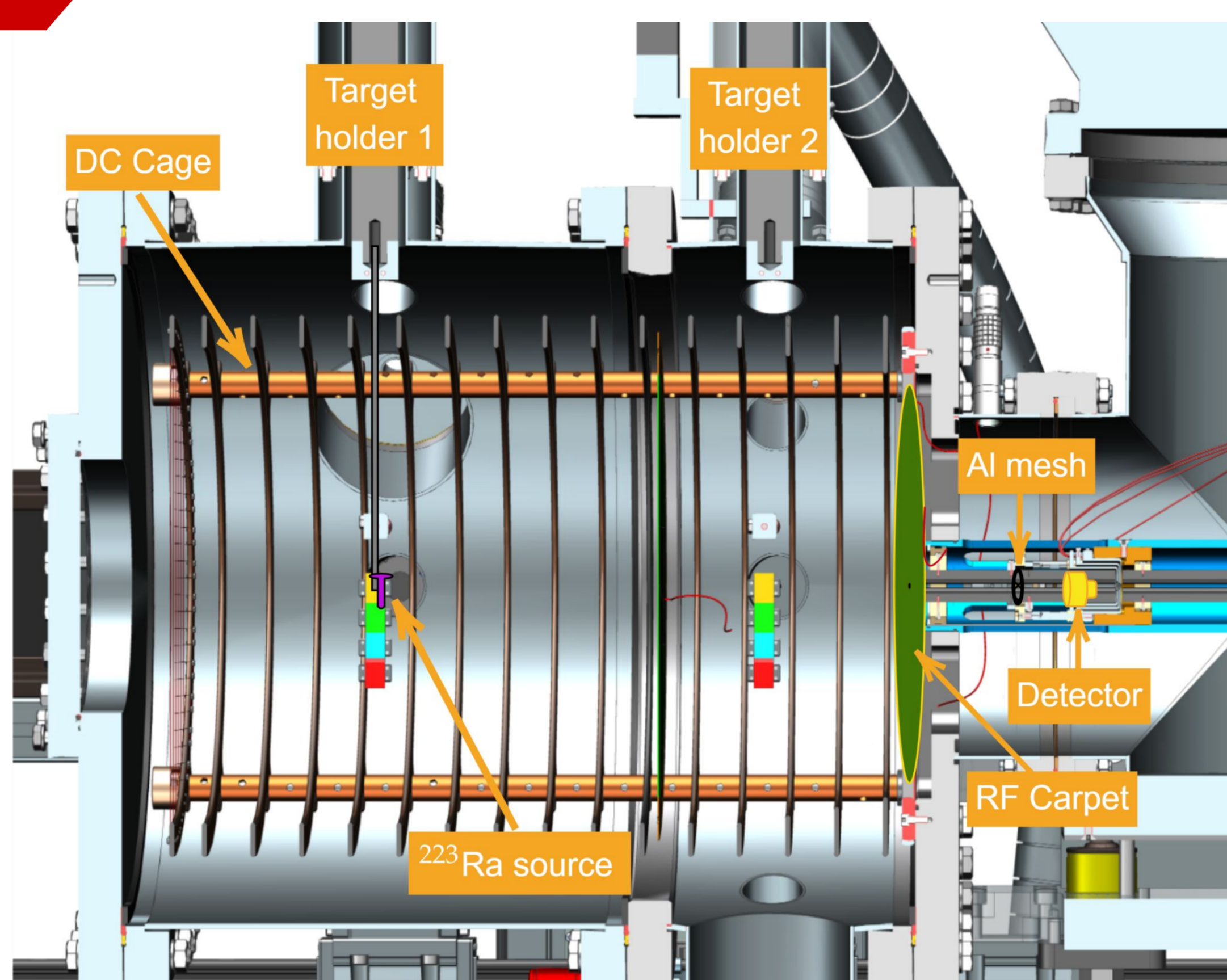
## 1 Motivation



## 2 CISE project

Our goal is to develop a new **Chemical Isobaric Separation** technique using a gas catcher. Gas catchers are used to slow down high-energy nuclear reaction products by interacting with a buffer gas. The ions lose energy in collisions with the buffer gas atoms through ionization and excitation. As a first step we are optimizing the ion extraction process within the gas catcher by testing different DC and RF settings.

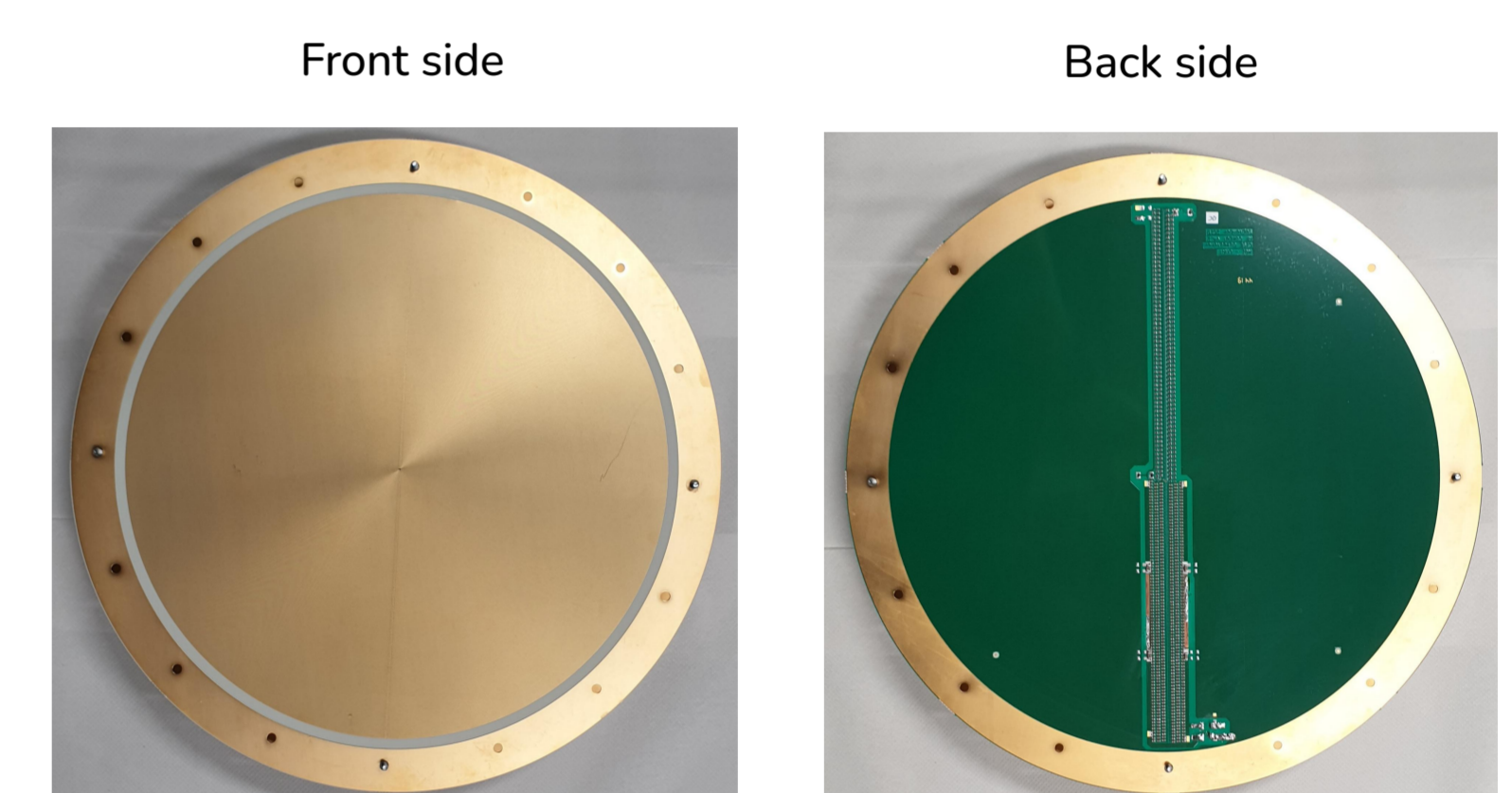
## 3 CISE gas catcher



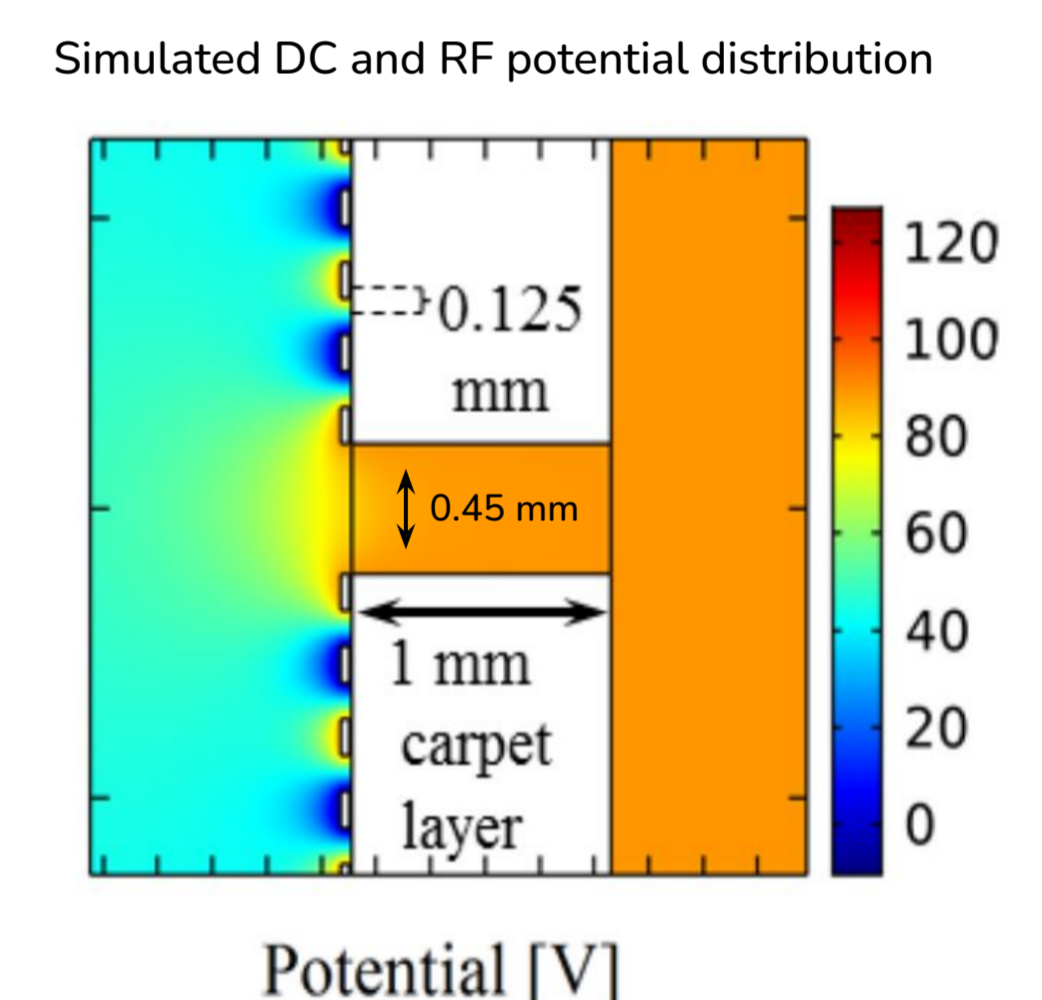
To study the extraction of ions we are using:

- A gas cell filled with 50 mbar of **Helium**. Helium has the advantage that it has a low density and high ionization potential, reducing the probability of ion neutralization.
- A  $^{223}\text{Ra}$  source that decays into  $^{219}\text{Rn}$ . Radon is a noble gas with high ionization potential, making it one of the most challenging elements to extract.
- High electric field gradients to reduce the probability of recombination and to achieve a shorter extraction time.

## 4 RF carpet

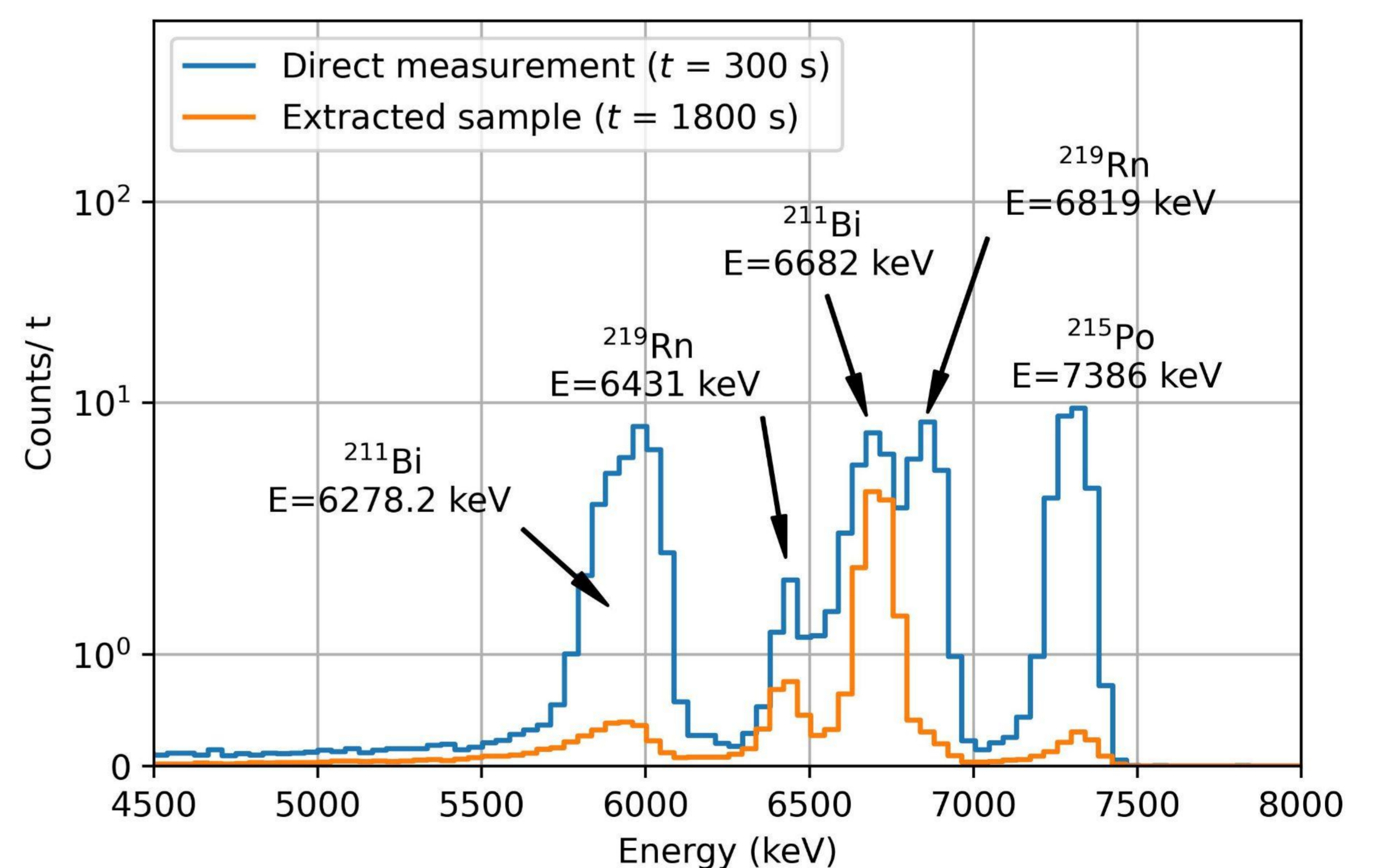
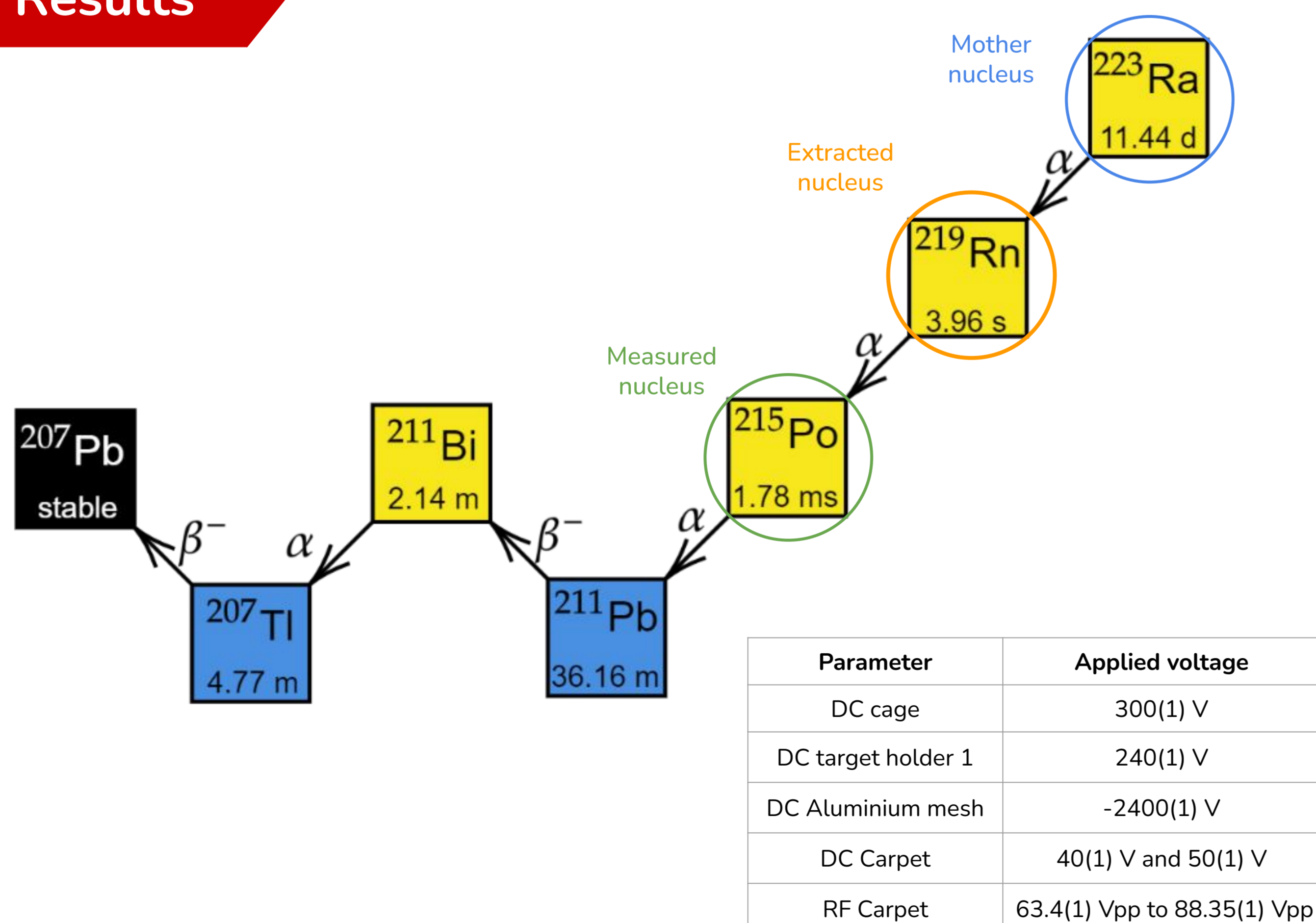


The DC carpet's electric field gradient pushes ions towards the center, while the time-averaged repelling force of the RF voltage makes them hover. Applying a  $90^\circ$  phase difference generates a traveling potential wave, allowing the ions to surf over the carpet towards the exit hole.



Andelić, B. (2021), *Direct mass measurements of No, Lr and Rf isotopes with SHIPTRAP and developments for chemical isobaric separation.*

## 5 Results



Extraction yields of 10-15% of  $^{219}\text{Rn}$  have been achieved.

## 6 Summary

- In this study, alpha spectroscopy measurements showed that  $^{219}\text{Rn}^+$ , which has a half-life of 3.96 s, was extracted from the gas catcher.
- The results indicated a maximum extraction efficiency of 15%. Further studies will be conducted to optimize the extraction efficiency and unlock the full potential of this technique.

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