

University of Groningen

## Ion-extraction from the CISE gas catcher

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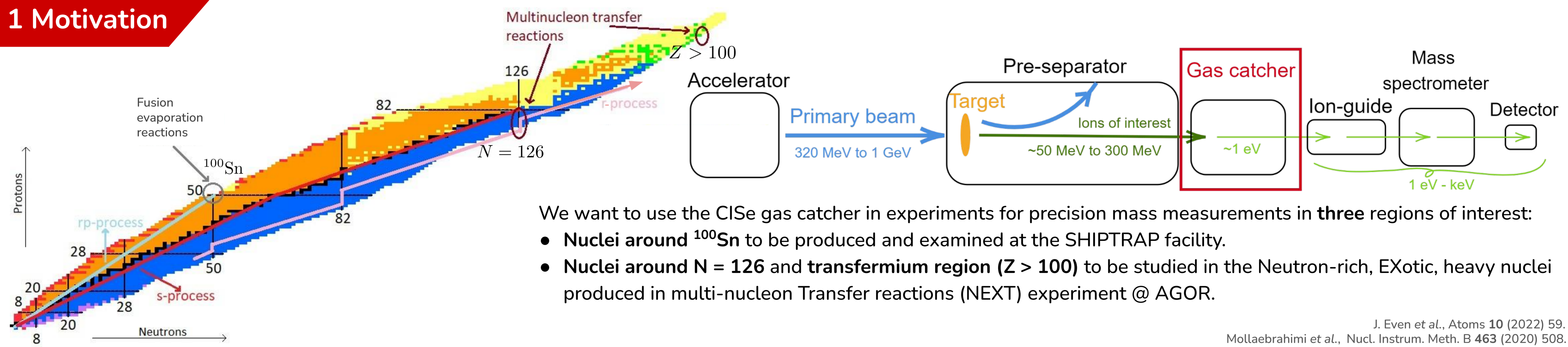
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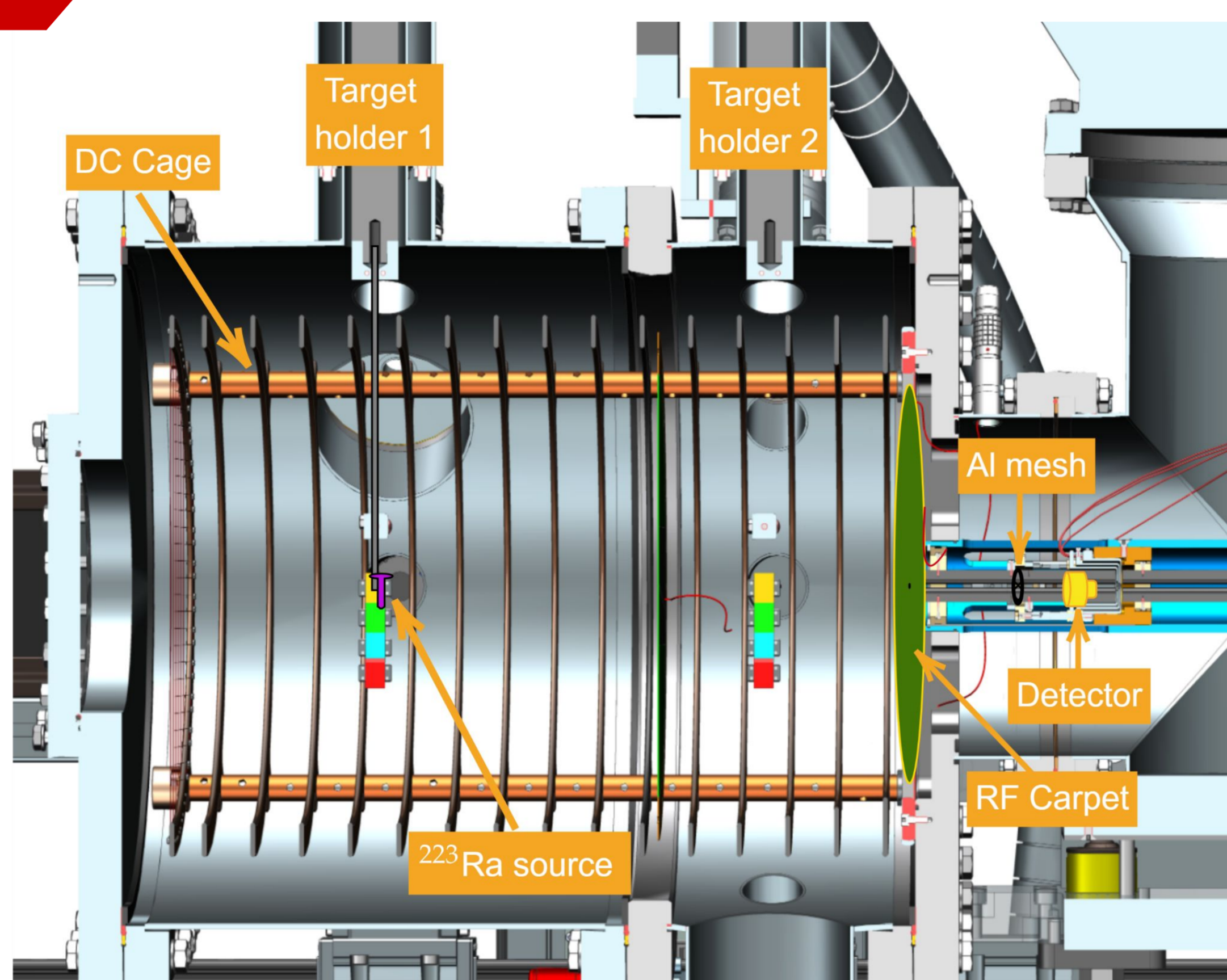
## 1 Motivation



## 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.

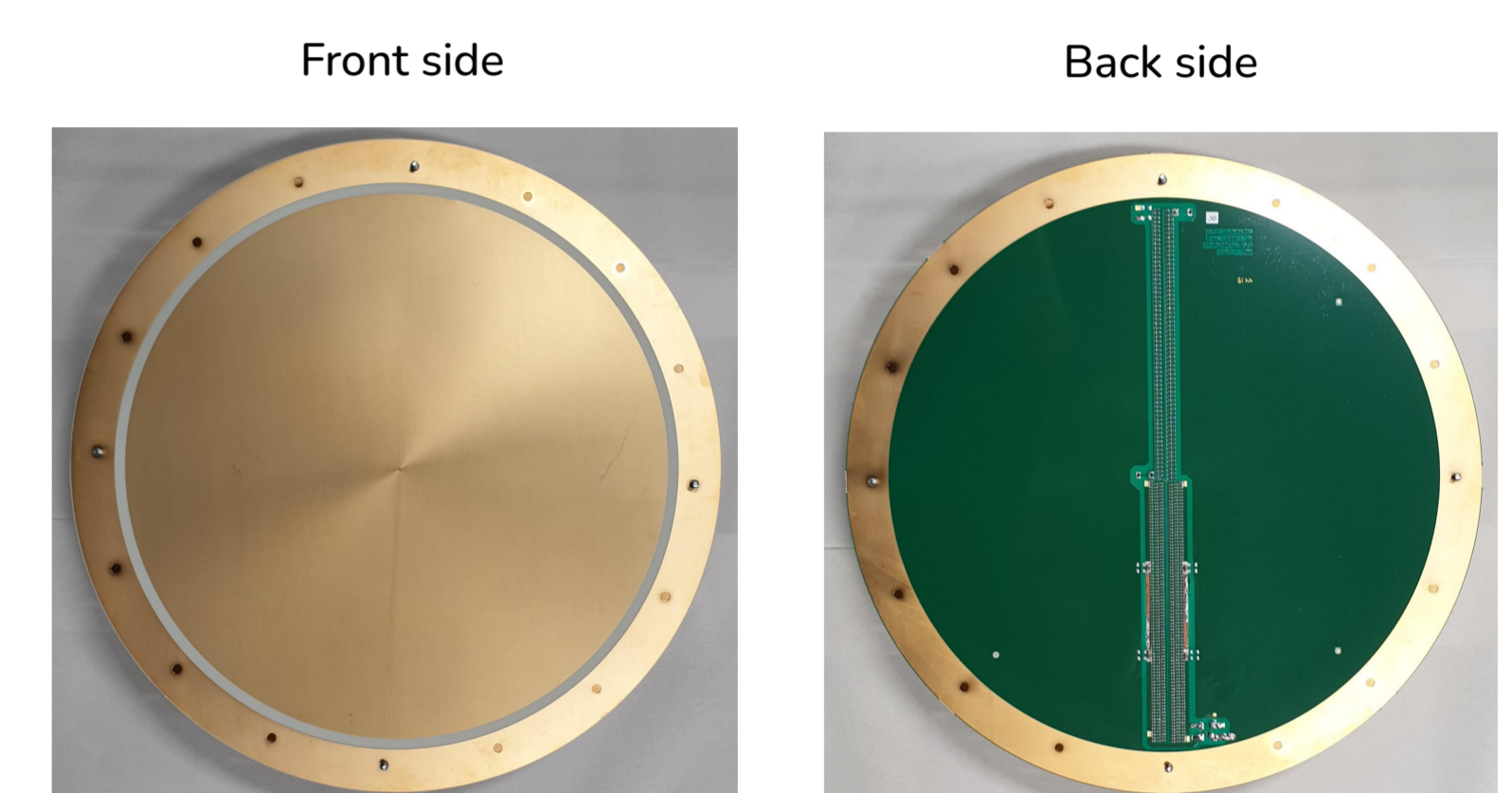
## 3 CISE gas catcher



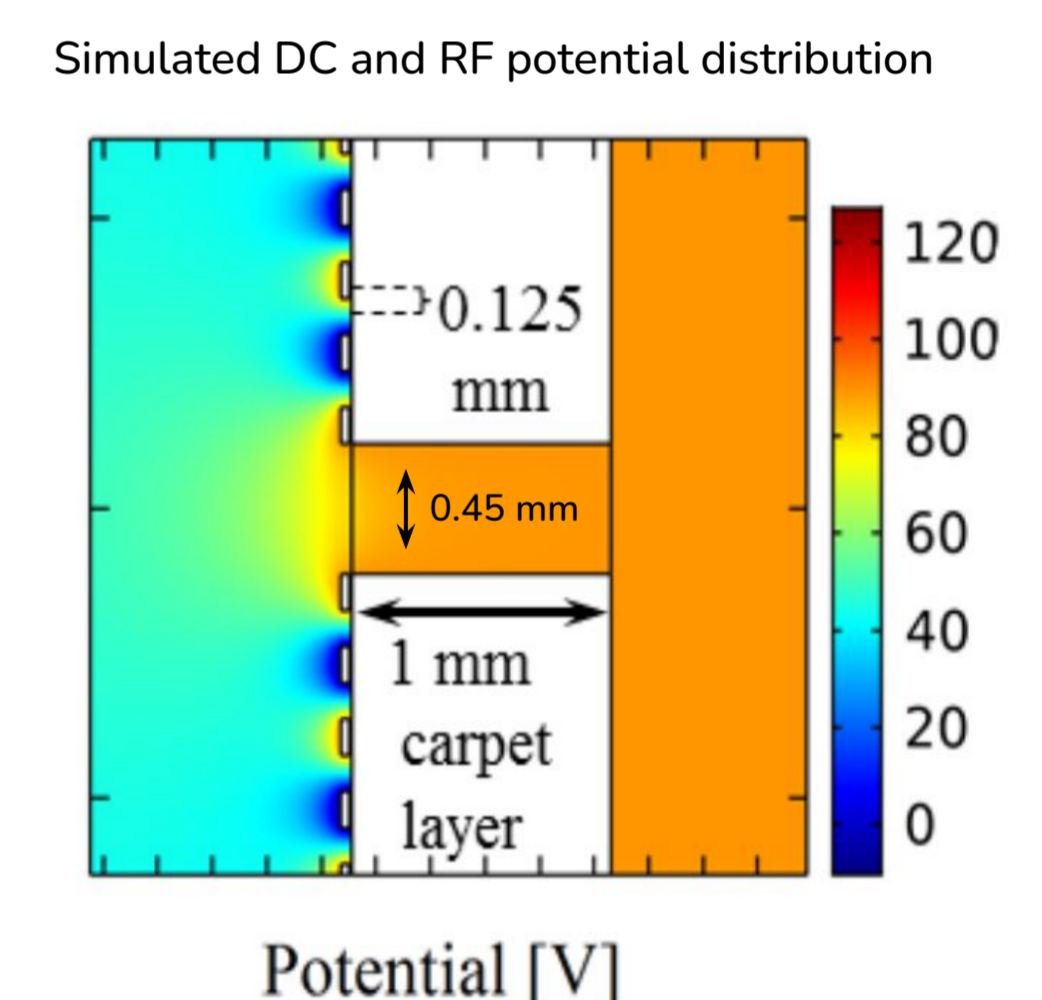
To study the extraction of ions we are using:

- 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

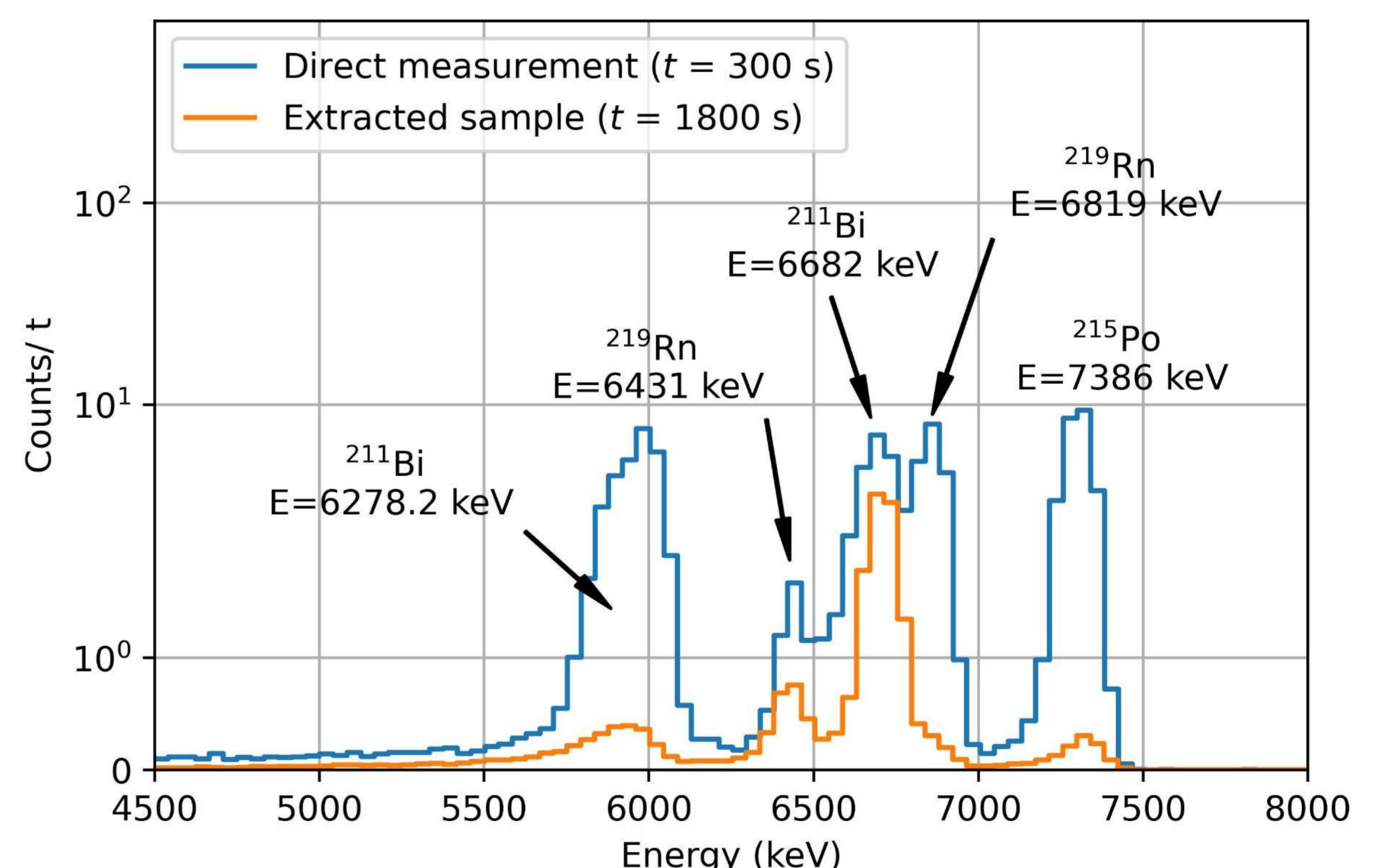
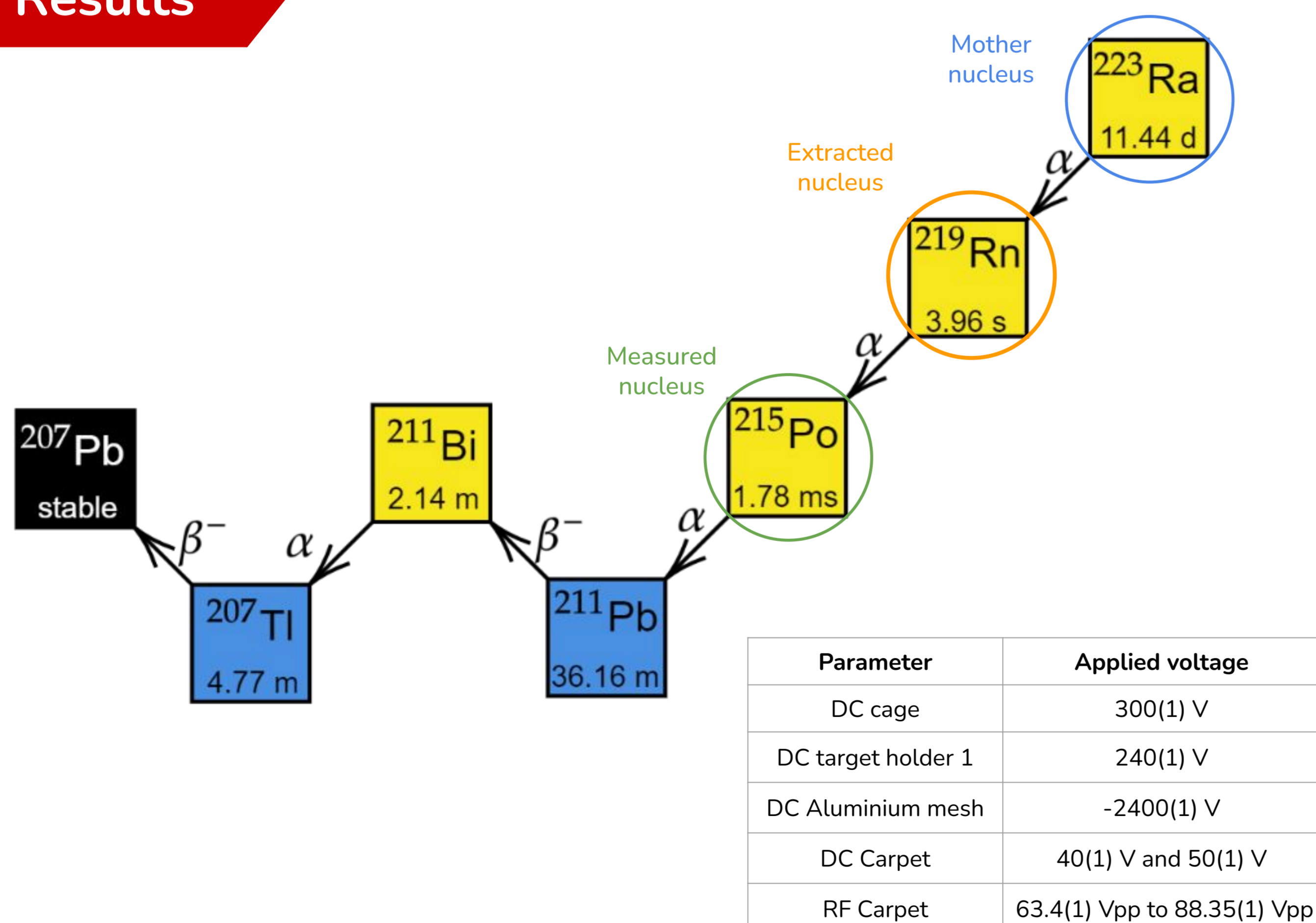


The DC carpet's electric field gradient pushes ions towards the center, while the time-averaged repelling force of the RF voltage makes them hover. Applying a  $90^\circ$  phase difference generates a traveling potential wave, allowing the ions to surf over the carpet towards the exit hole.



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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