



JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

The MARA-LEB RFQ Guide System

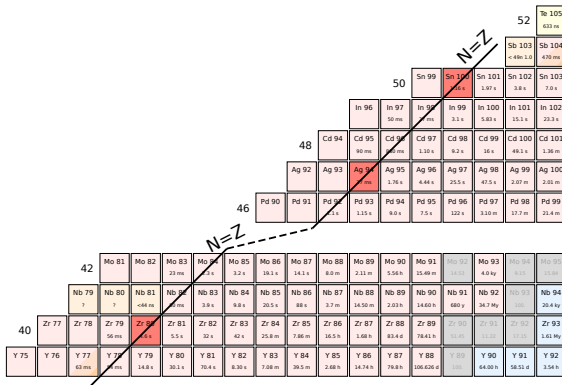
Jorge Romero

2021 Euroschool on Exotic Beams



Motivation

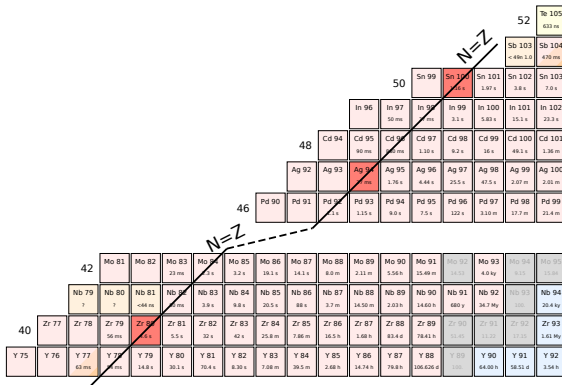
- ▶ Studying the $N=Z$ region of the nuclear chart





Motivation

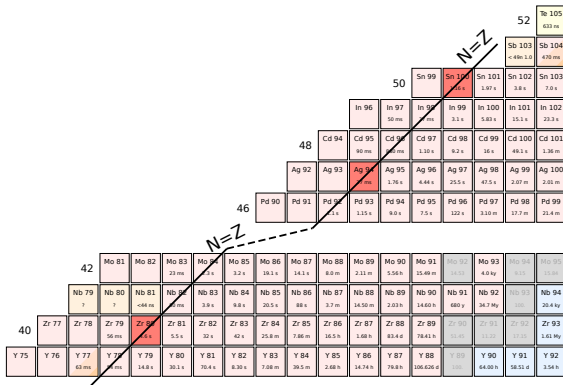
- ▶ Studying the $N=Z$ region of the nuclear chart
- ▶ Test predictions of the nuclear shell model





Motivation

- ▶ Studying the $N=Z$ region of the nuclear chart
 - ▶ Test predictions of the nuclear shell model
 - ▶ Increase understanding in the astrophysical rp process

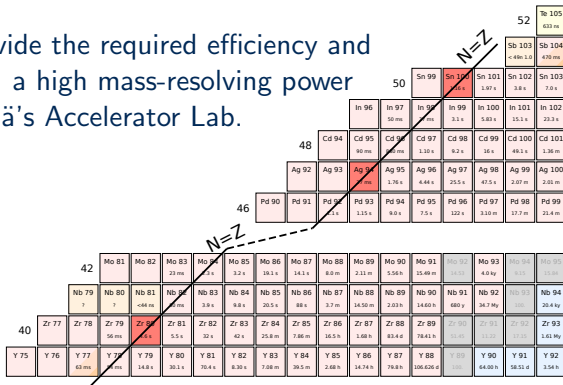




Motivation

- ▶ Studying the $N=Z$ region of the nuclear chart
 - ▶ Test predictions of the nuclear shell model
 - ▶ Increase understanding in the astrophysical rp process

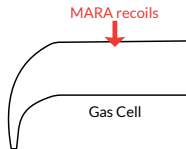
MARA-LEB will provide the required efficiency and selectivity to MARA, a high mass-resolving power separator in Jyväskylä's Accelerator Lab.





Setup

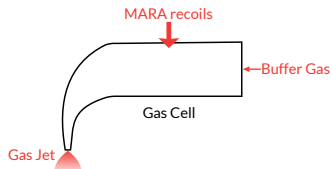
The MARA-LEB Gas Cell is placed at MARA's focal plane.





Setup

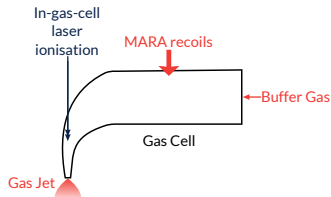
Recoils from MARA are thermalised and neutralised by a buffer gas.





Setup

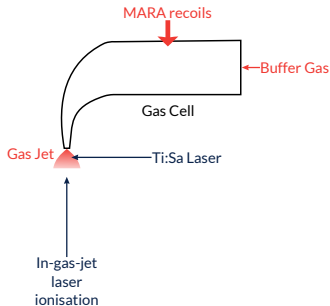
Recoils can be re-ionised using laser ionisation in the gas cell.





Setup

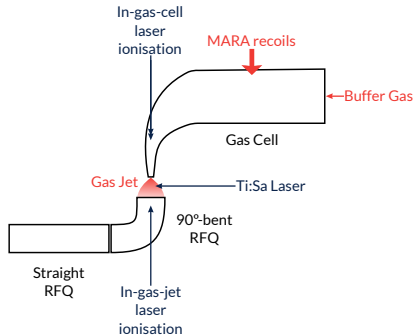
In-gas-jet laser ionisation can also be performed for better resolution.





Setup

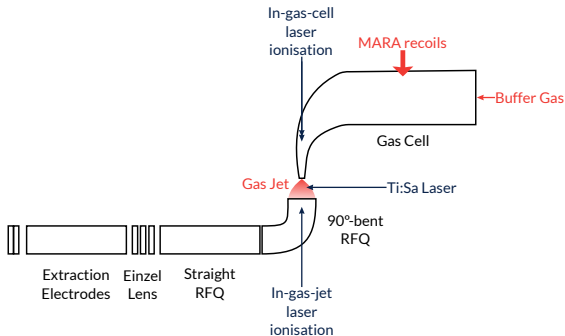
Ions are confined and transported using radio-frequency quadrupole ion guides.





Setup

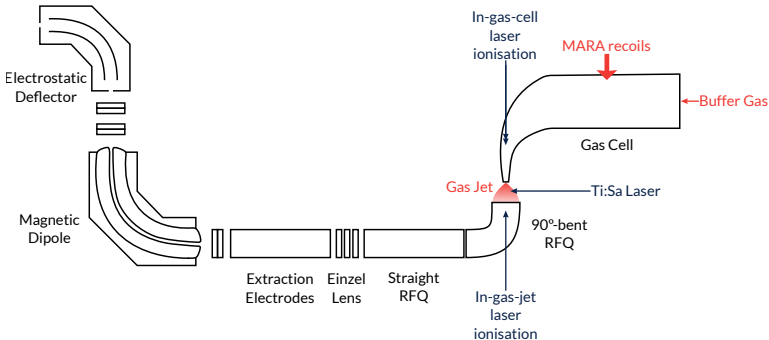
Ions are focused and accelerated to 30 keV by extraction electrodes.





Setup

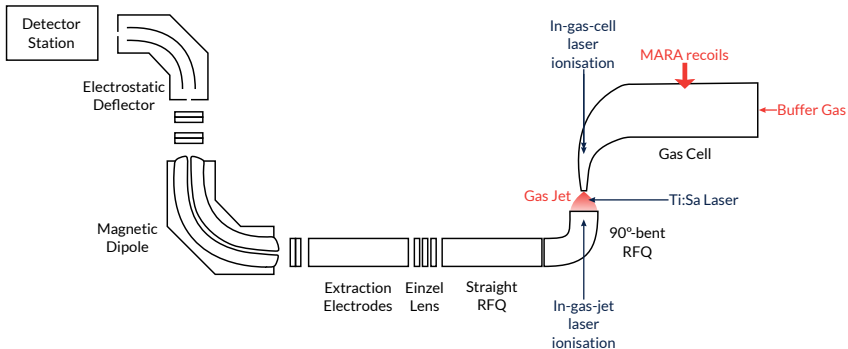
A magnetic dipole and an electrostatic deflector transport the ions vertically and provide further mass selection.





Setup

The ions are finally transported to detectors.





Simulations

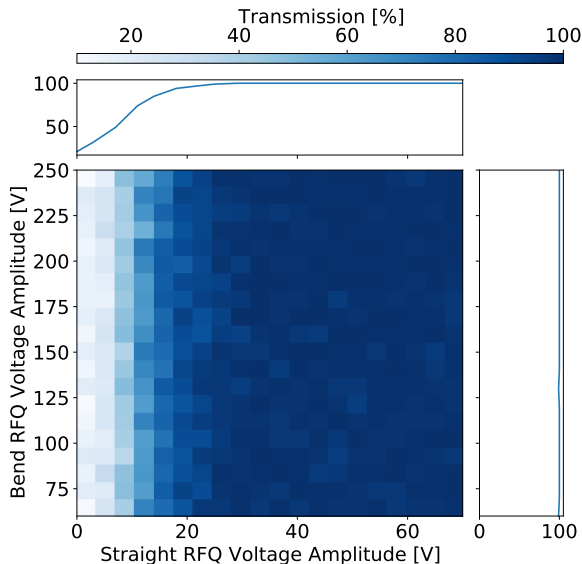


Simulations of transmission efficiency through the RF guides in terms of applied voltages was performed in Simion.



Simulations

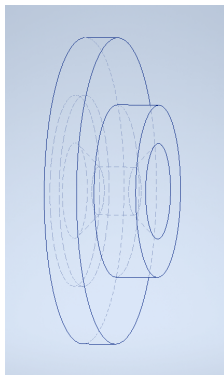
Optimal working voltages were determined.



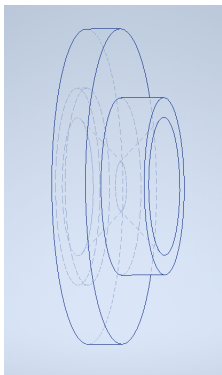


Simulations

A new geometry for a differential pumping section aperture was tested.



Old geometry



New Geometry