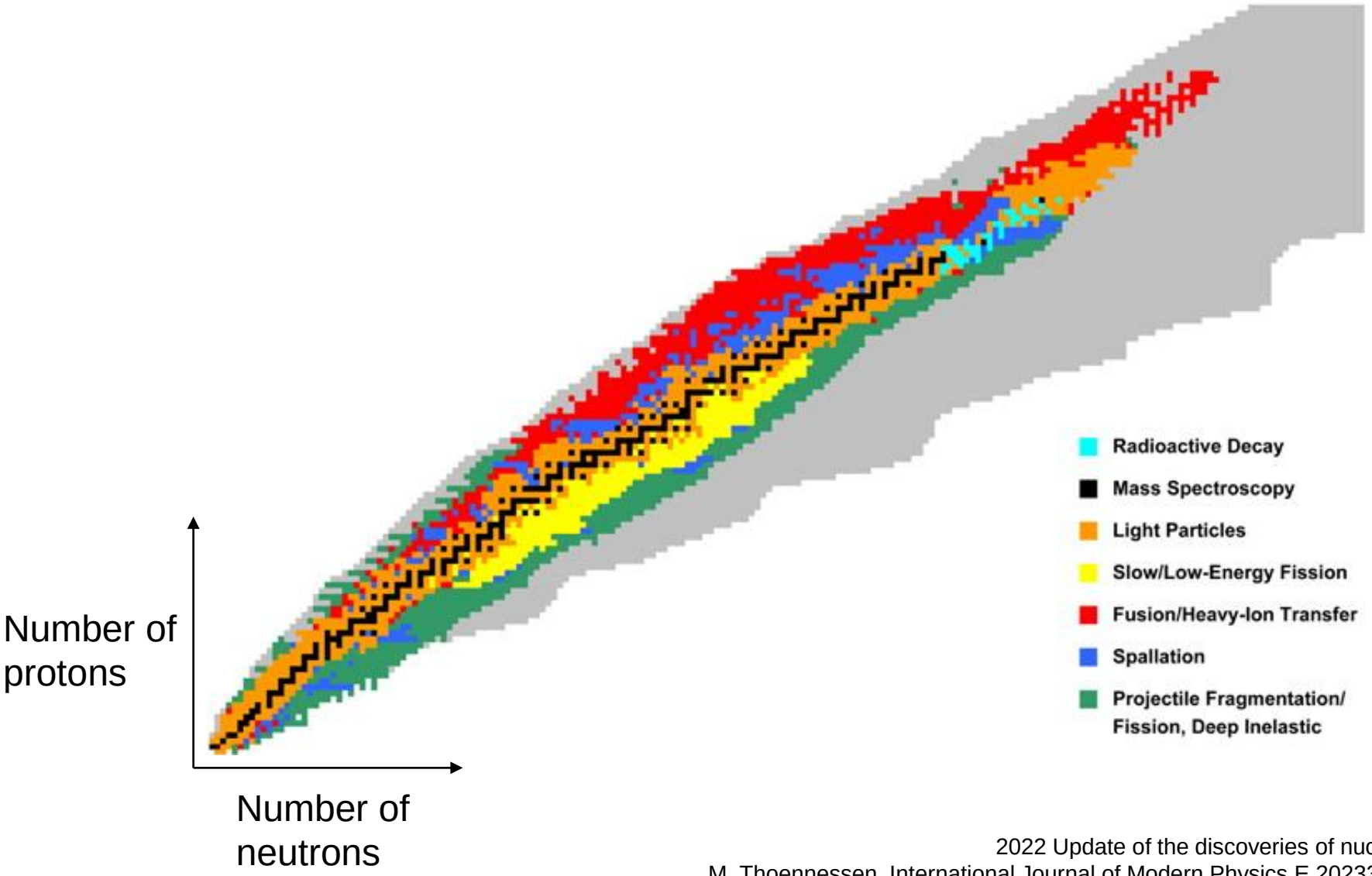
Status of the NEXT experiment

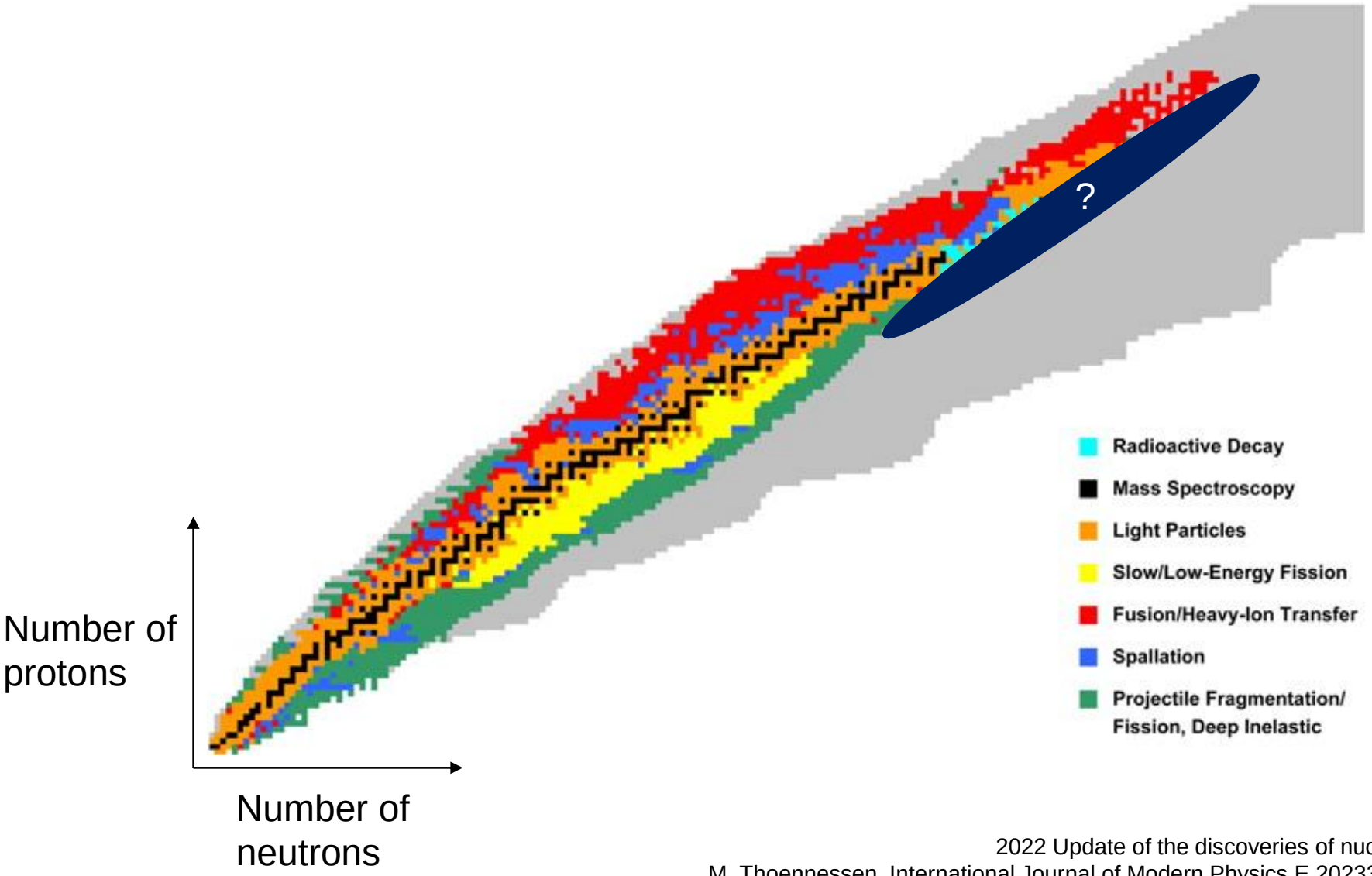
Jasper Westbroek,
On behalf of the NEXT collaboration

Nuclear chart in a nutshell



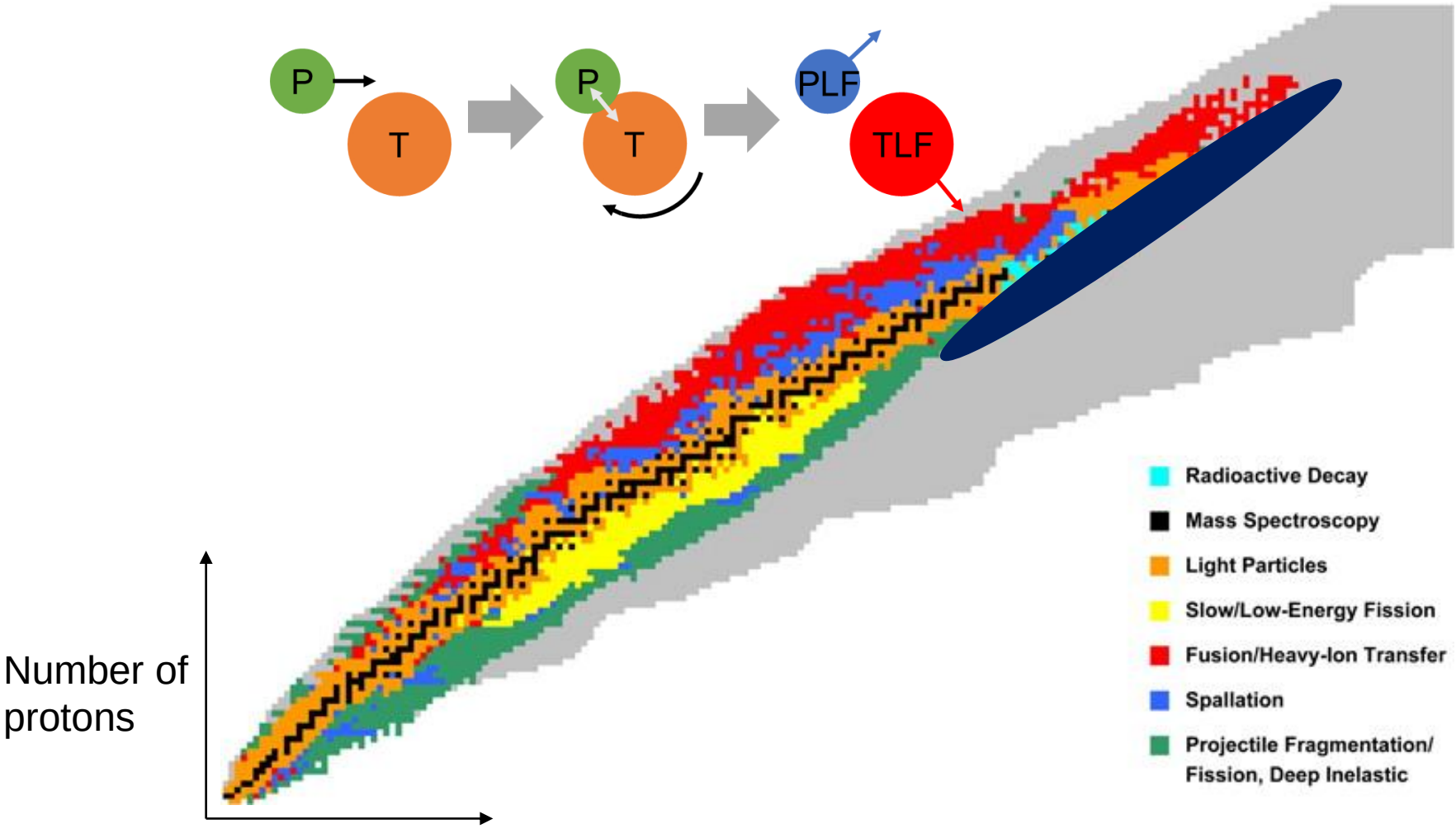
2022 Update of the discoveries of nuclides
M. Thoennessen, International Journal of Modern Physics E 202332:01

How to reach heavy, neutron rich isotopes?



2022 Update of the discoveries of nuclides
M. Thoennessen, International Journal of Modern Physics E 202332:01

Multi-Nucleon Transfer reactions



2022 Update of the discoveries of nuclides
M. Thoennessen, International Journal of Modern Physics E 202332:01

Challenges with MNT reactions

- Wide angular distribution
- Isotope separation and identification

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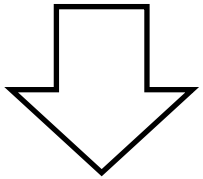

- ❑ Spectrometer with a large angular acceptance and background separation
- ❑ A setup that can be used to identify isotopes based on masses and/or decay properties

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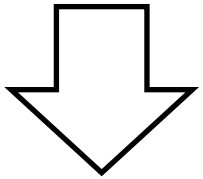

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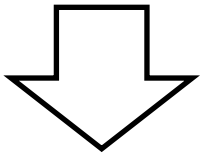

Neutron-rich **EX**otic, heavy, nuclei produced in multinucleon **T**ransfer reactions (NEXT)

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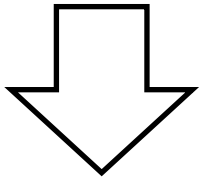

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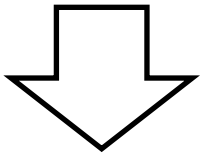

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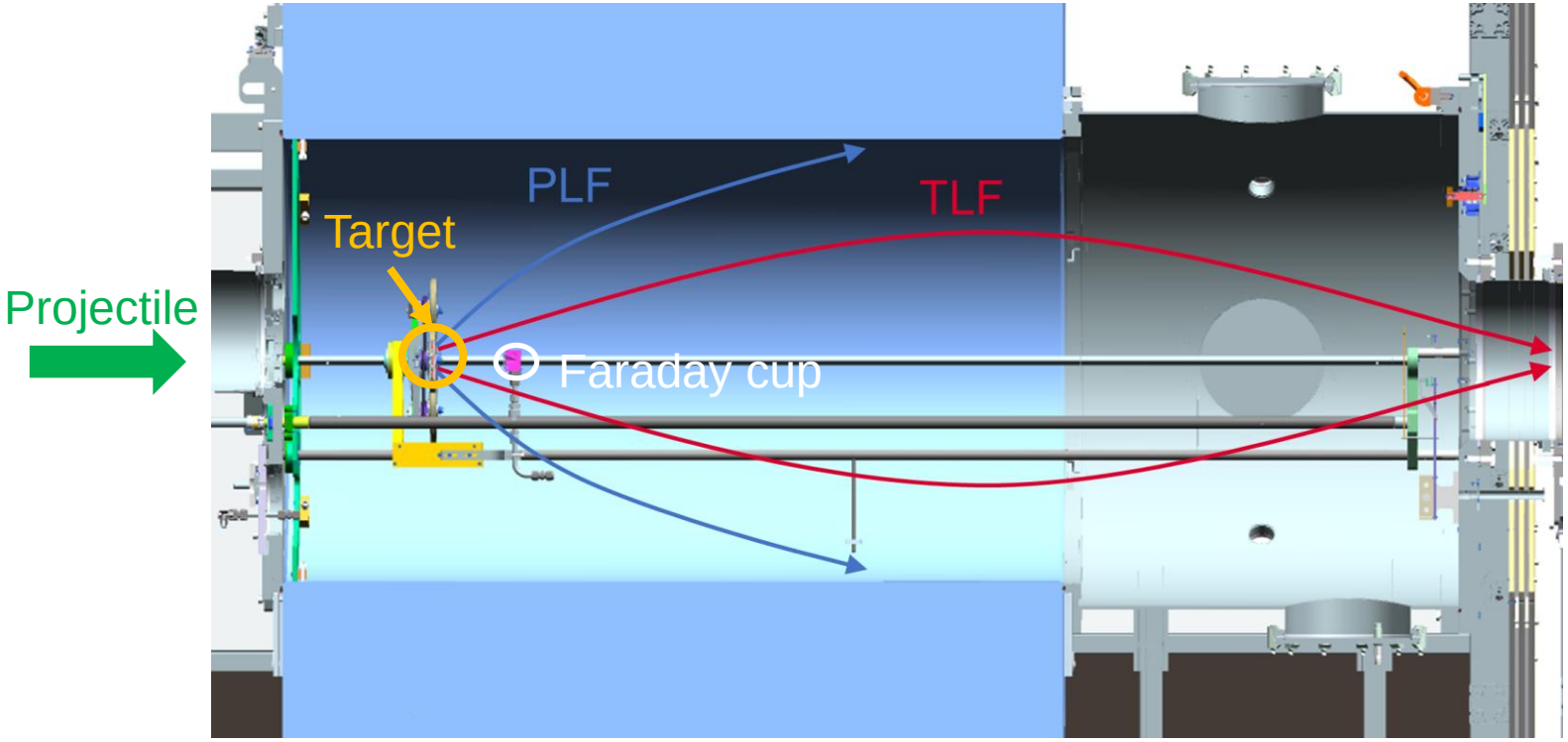
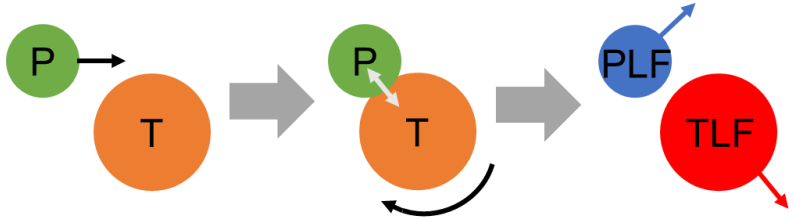
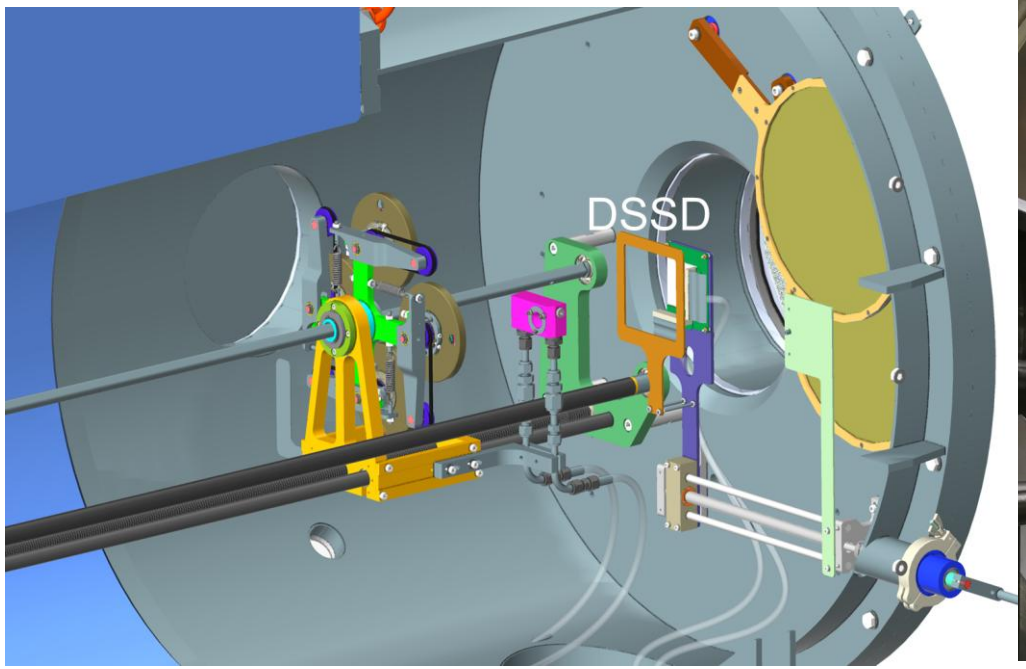
Solenoid separator





Double sided Silicon Strip detector



- Identification of short lived alpha decaying isotopes

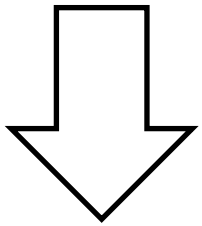
Solenoid separator

- Solenoid is installed and at a magnetic field of 3 Tesla

✓Spectrometer with a large angular acceptance and background separation

Challenges with MNT reactions

- Wide angular distribution
- Isotope separation and identification



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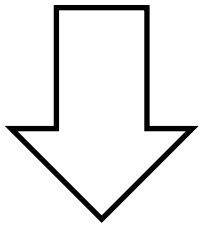

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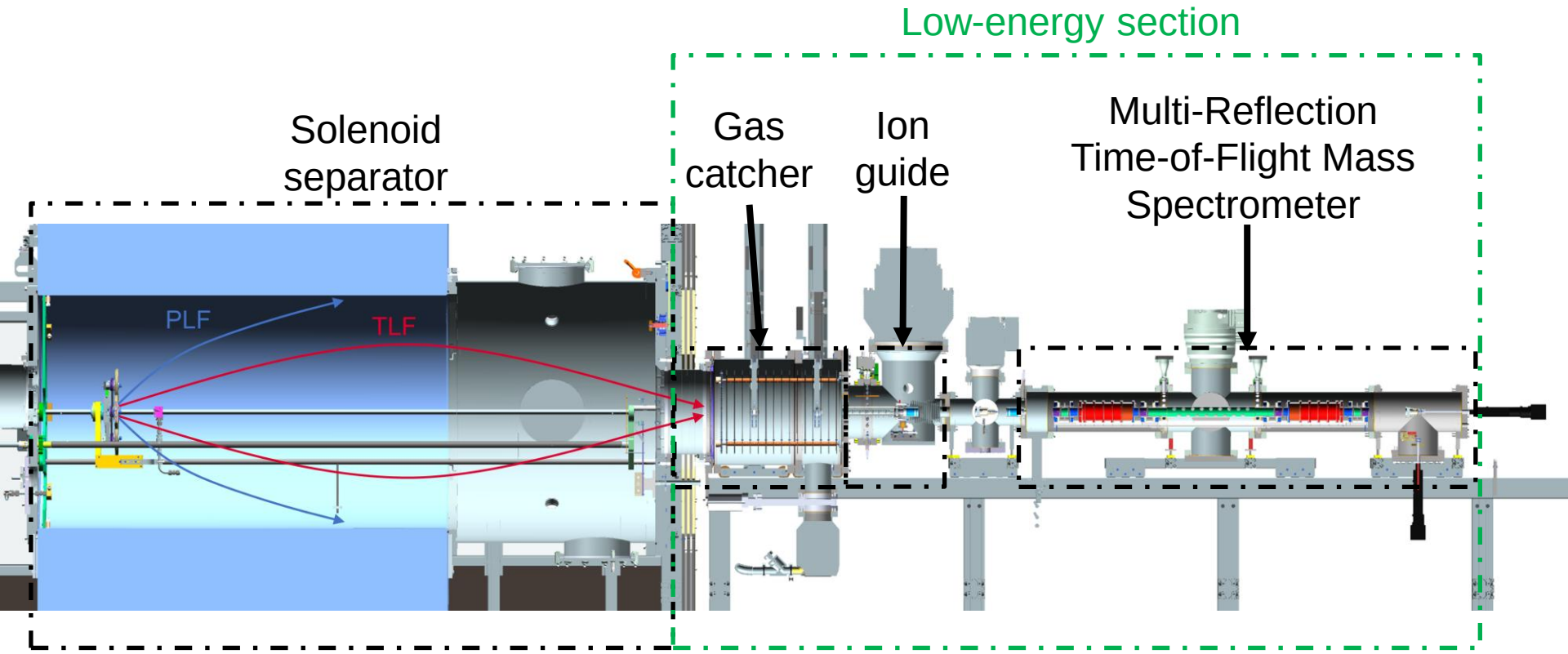
Isotope identification

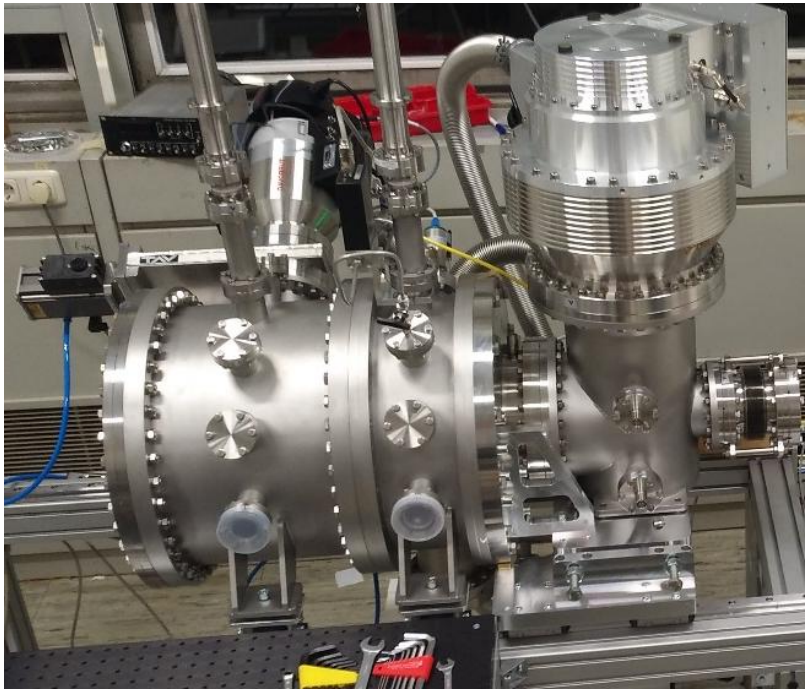
- A setup that can be used to identify isotopes based on masses and/or decay properties
  - Cooling & bunching of ions
  - Mass spectrometer
  - Mass selected decay spectroscopy

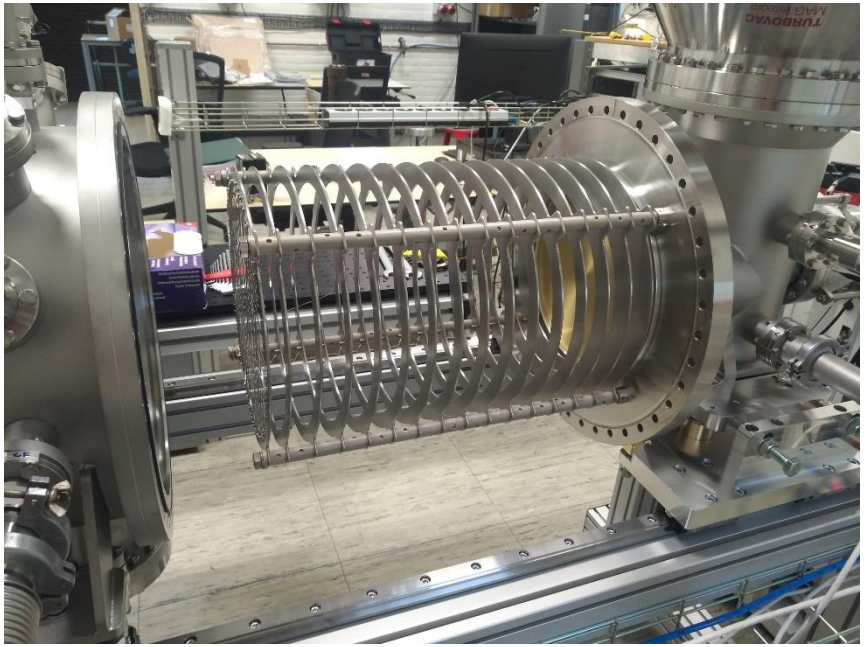
NEXT – low-energy section



Energy of the TLF's:
50-400 MeV

Gas catcher – Cooling of TLF's

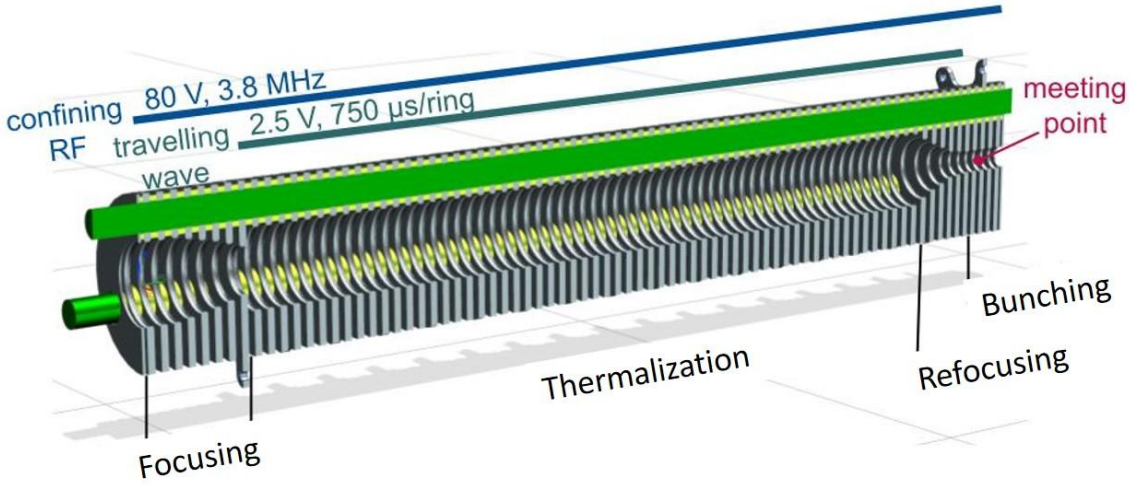


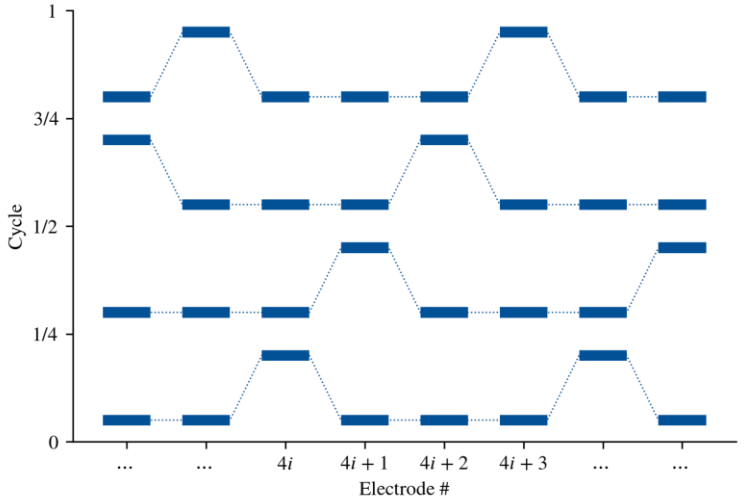


- Helium buffer gas ~50 mbar
- DC cage, 3V/cm
- RF carpet, 80 Vpp @ ~6 MHz
- Extraction efficiency ~15%

A. Mollaebrahimi et al., NIM B, 463, 508 (2020).

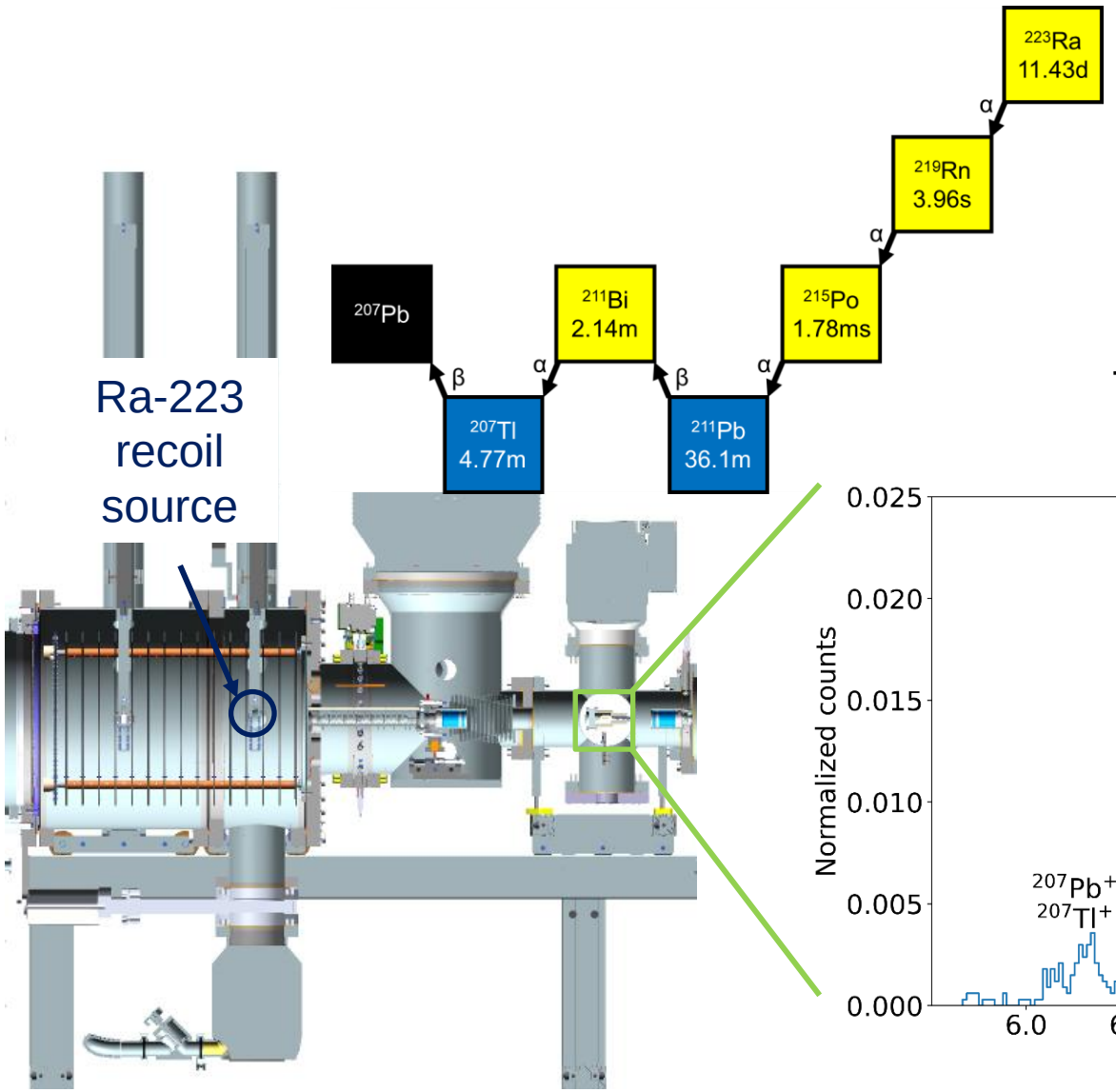
Ion guide – Cooling and bunching



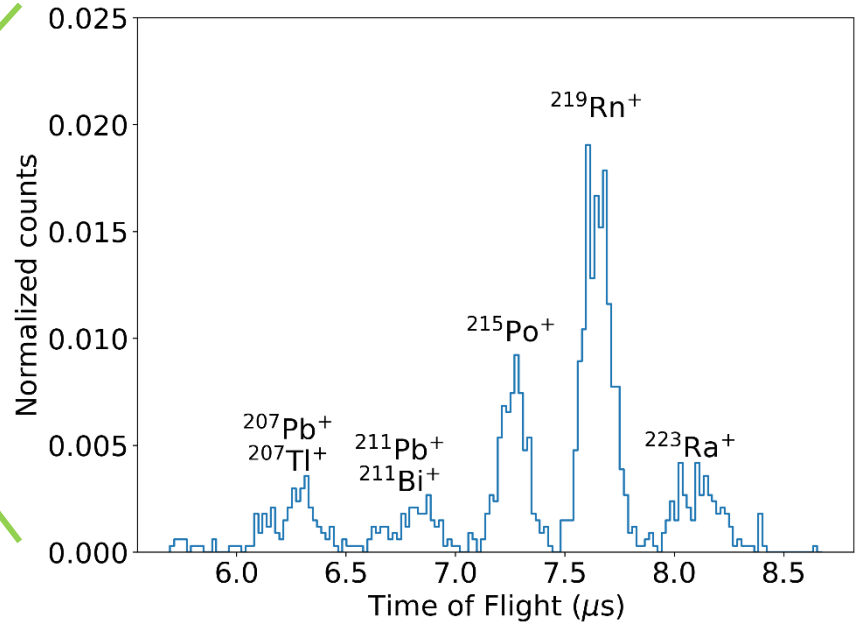


X. Chen et al., *Int. J. Mass Spectrom.* 477 (2022) 116856

Gas catcher and ion guide



Time of Flight spectrum



Isotope identification

- A setup that can be used to identify isotopes based on masses and/or decay properties
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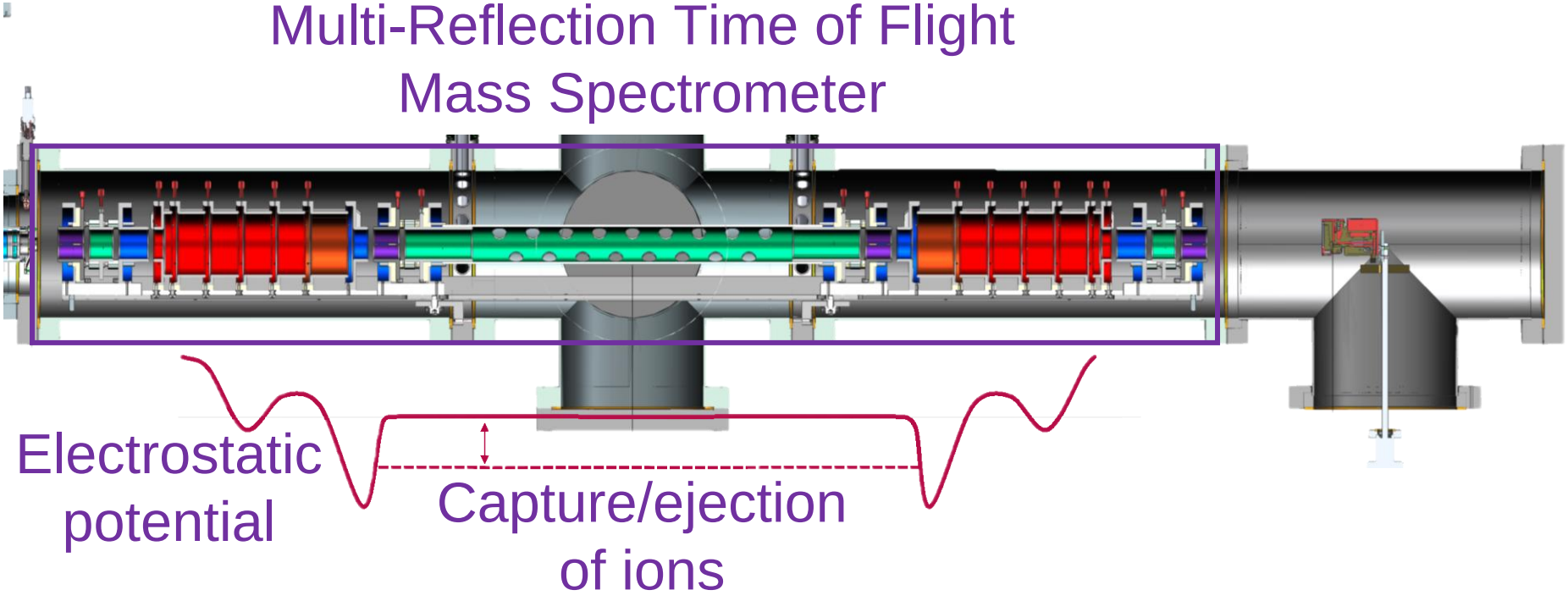
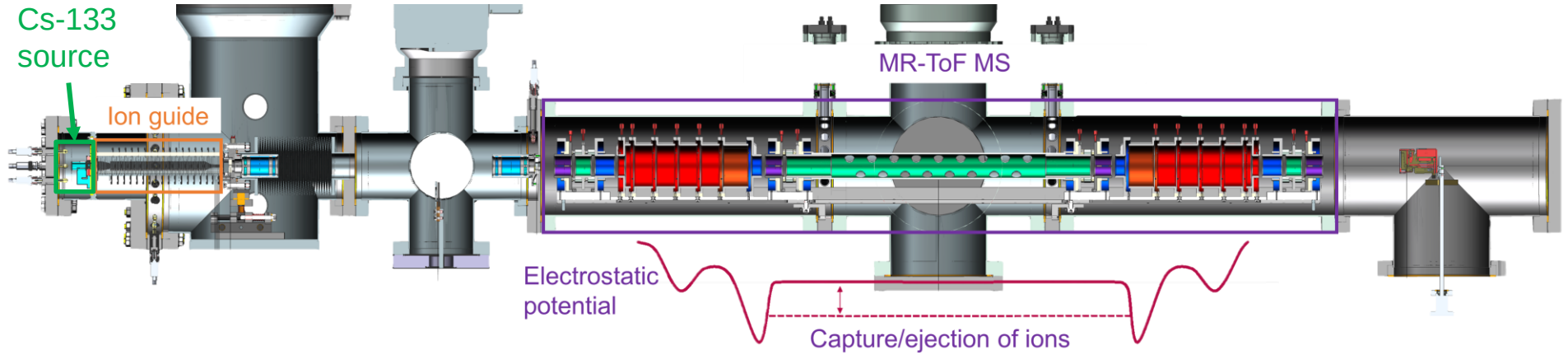
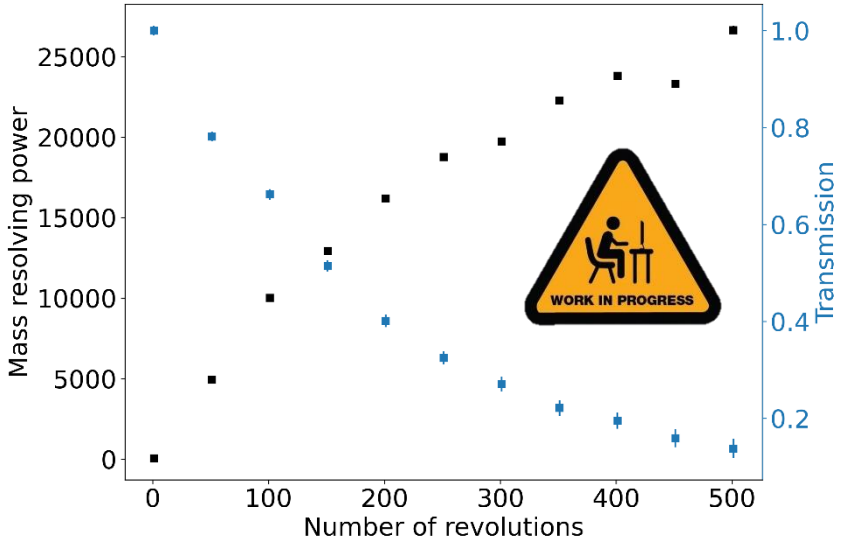
Mass measurements



M. Schlaich, Master thesis, TU Darmstadt, 2021
M. Schlaich *et al*., Int. J. Mass Spectrom. 495, 117166 (2024)

Ion guide and MR-ToF MS





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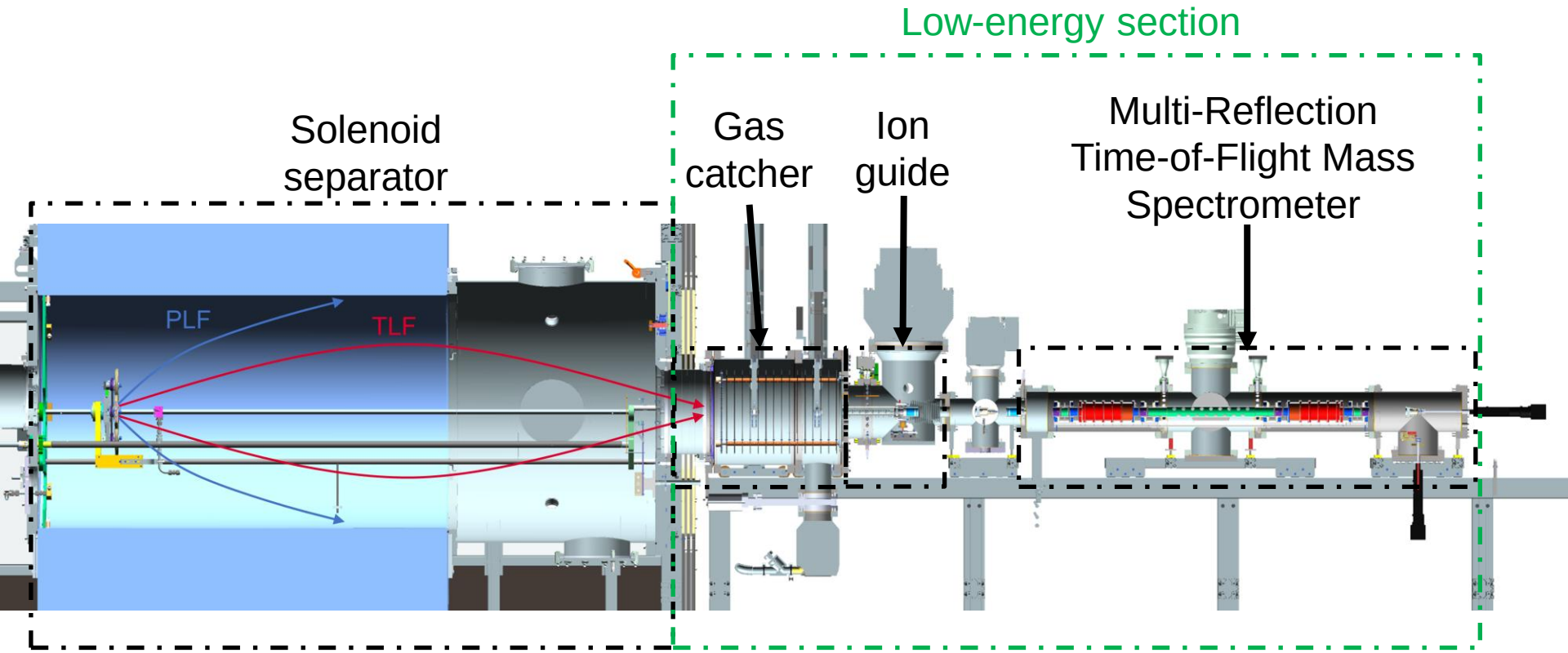
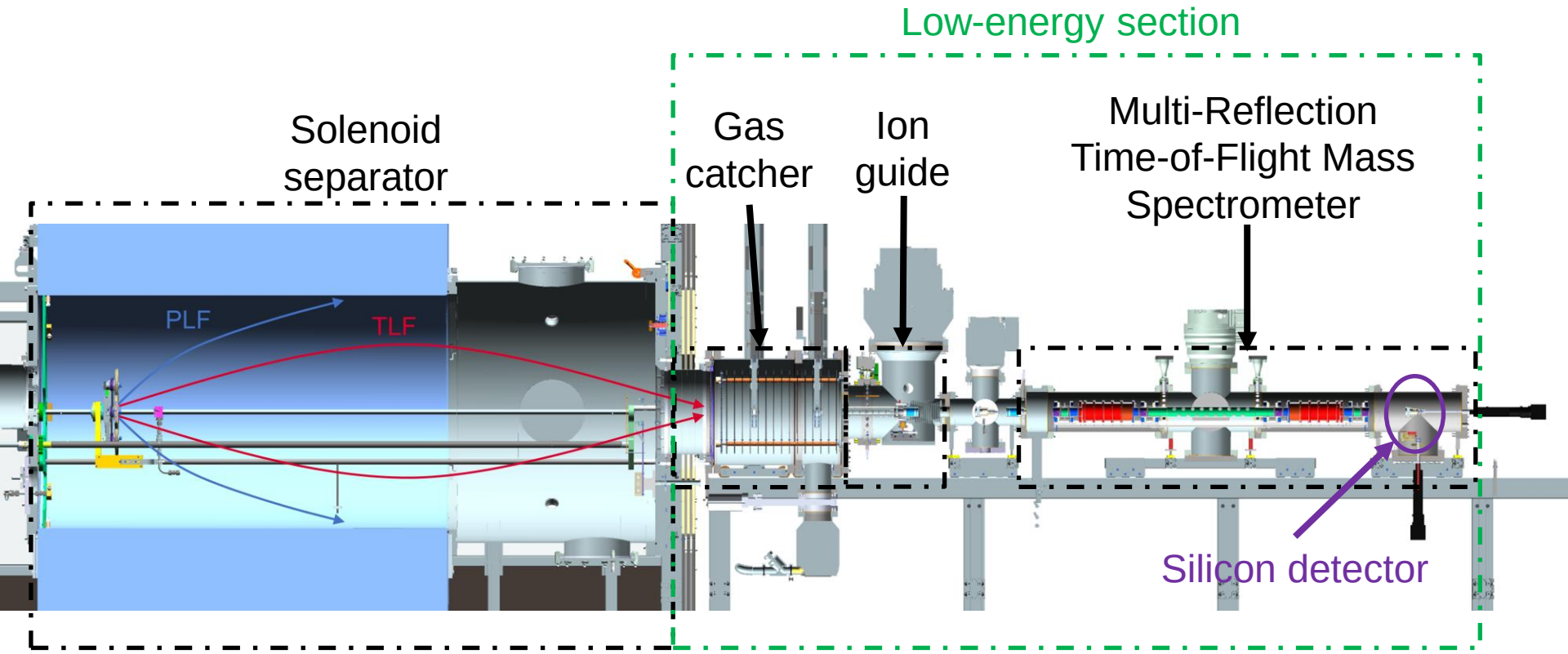
Detectors in NEXT



Mass selected decay spectroscopy



Conclusion & outlook

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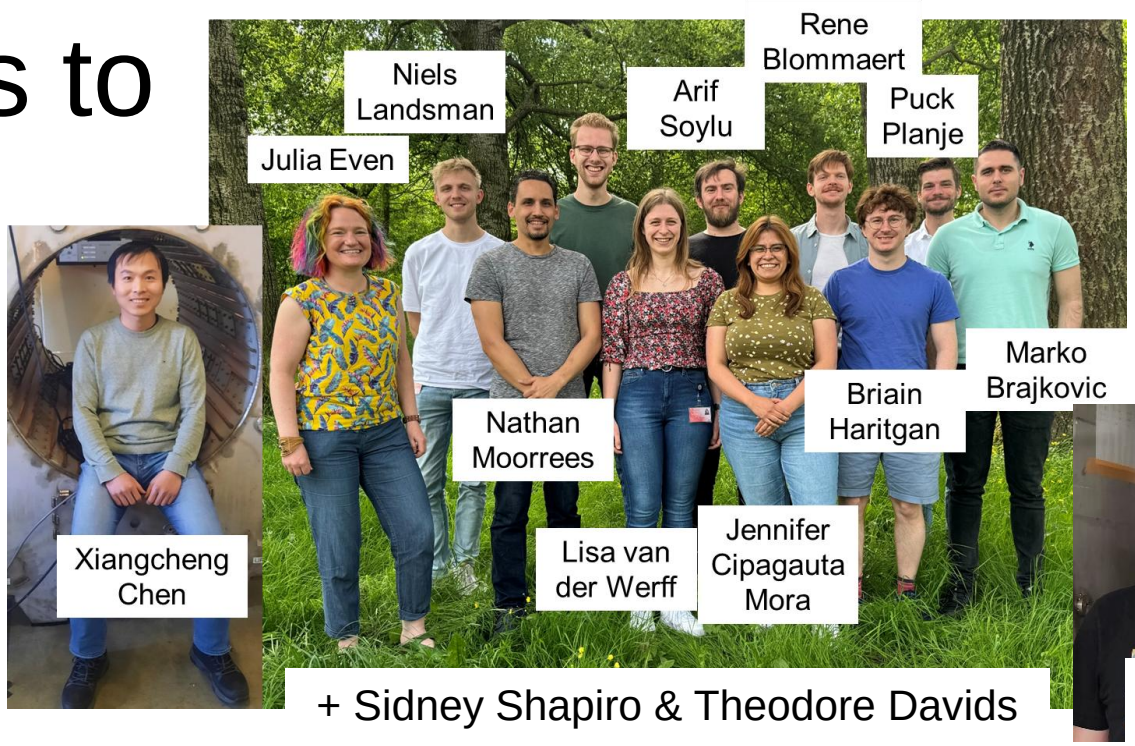
- NEXT is ready for first beam on target experiments
- Future of NEXT: precise mass measurements and decay studies of heavy, neutron-rich exotic nuclei

Thanks to



M. Block (GSI, HIM UMainz); L. Schweikhard (U. Greifswald); P. Fischer (U. Greifswald); M. Schlaich (TU Darmstadt); F. Wienholtz (TU Darmstadt); J. Sáren (U. Jyväskylä); J. Uusitalo (U. Jyväskylä)

The accelerator team, mechanical and electronic workshop at Partrec, UMCG

Thank you for your attention!

Detectors in NEXT