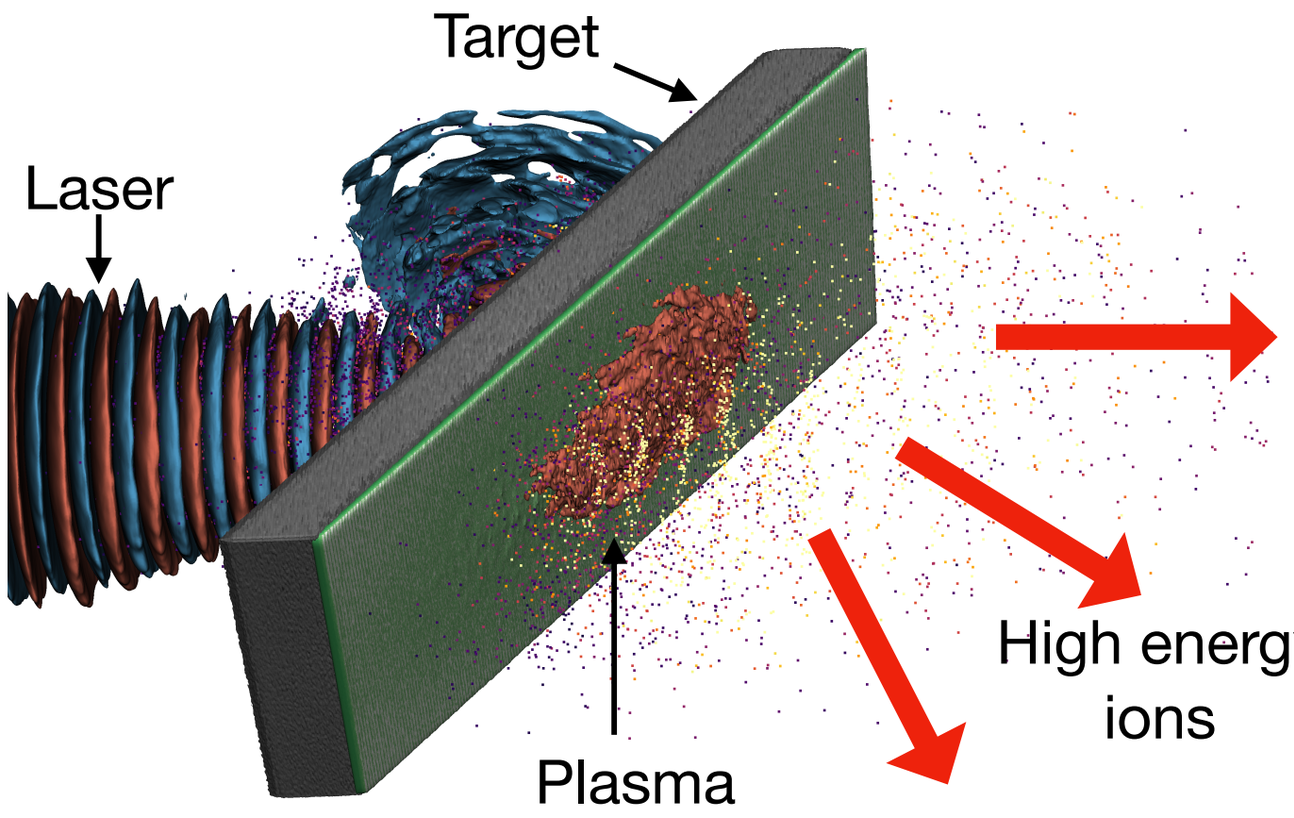
Areas of risk for ITRF ion source

More details in the CDR!

WPB meeting - 29th Oct 2024

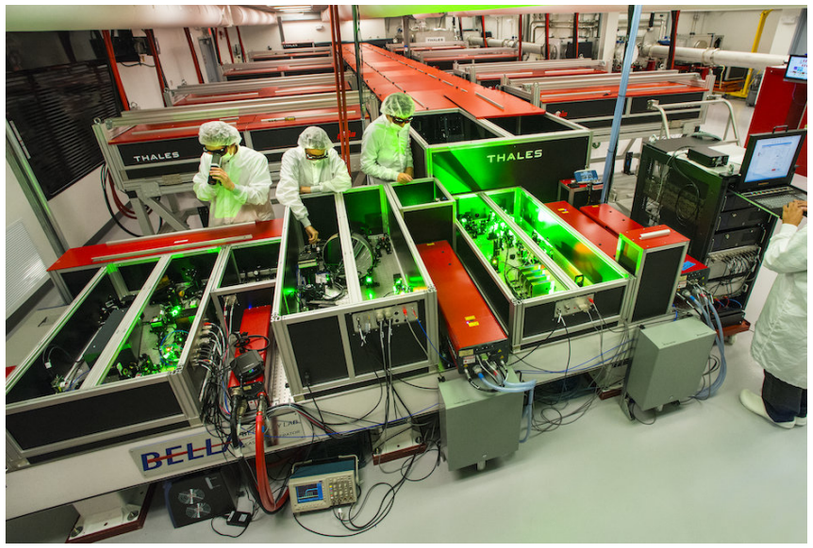
Laser driven ion source for LhARA



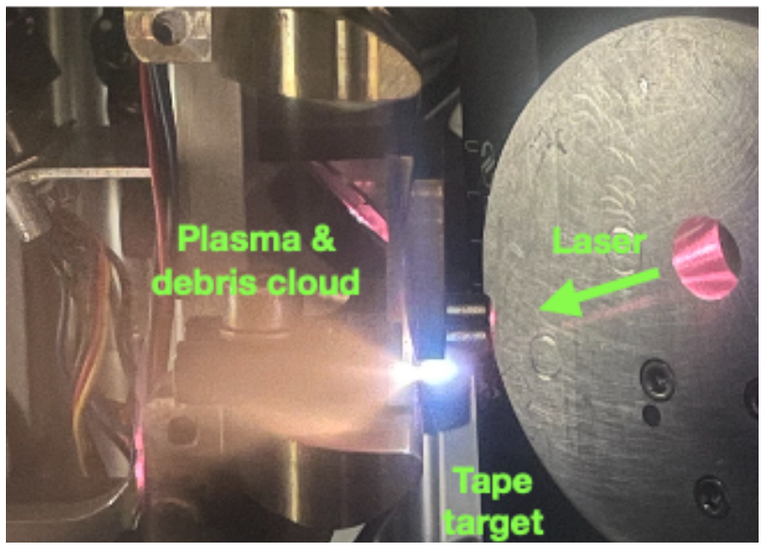
- High energy (e.g. ~15 MeV p+, 4 MeV/u C6+) from source
- Needs to operate at 10 Hz for long periods
- Aiming to deliver 10^9 protons or 10^8 carbon ions per shot, eventually other ions

Key outstanding challenges & risks

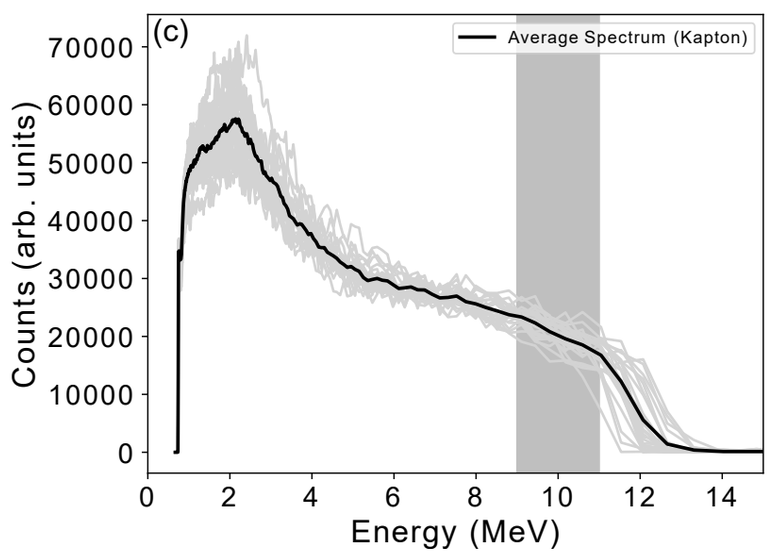
High power laser



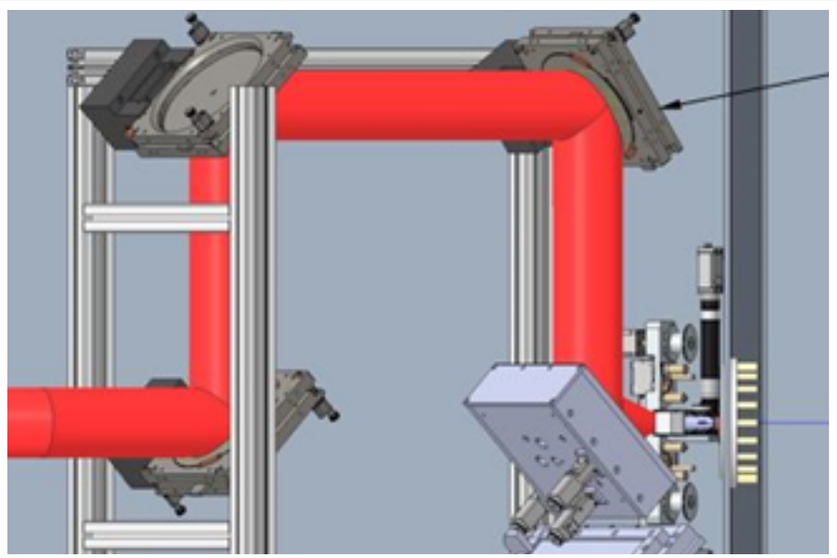
Targetry



Source delivery

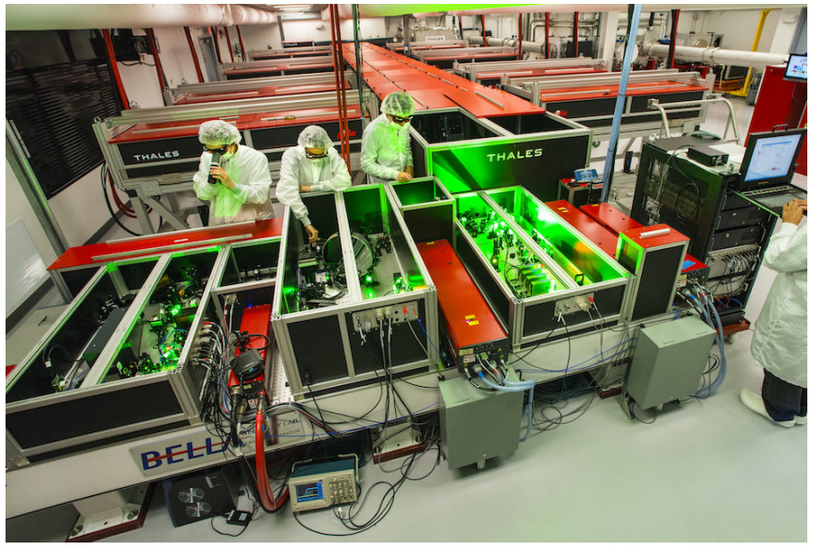


Interface challenges



Key outstanding challenges & risks

High power laser



Laser specification

- Laser energy
- Laser contrast
- Tolerances
- Diagnostics

Operational risk

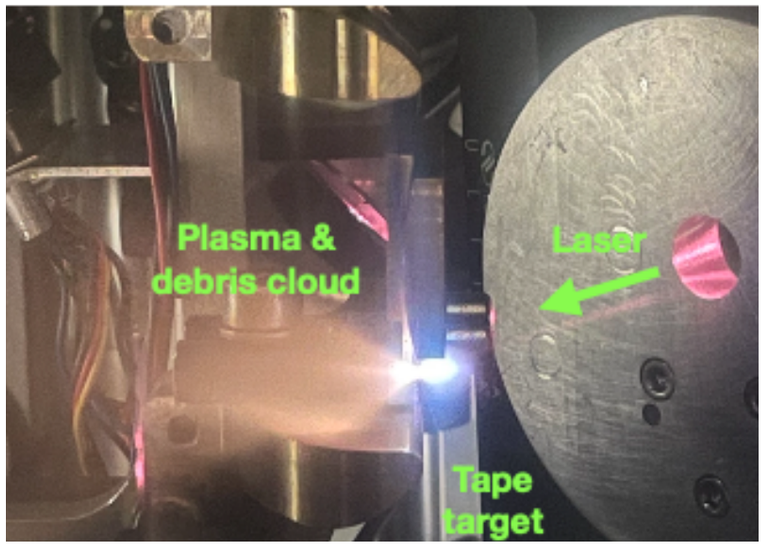
- Component failure
- System overhead
- Maintenance

Key outstanding challenges & risks

Targetry for Z > 1 particles

- Not clear at high rep
- Currently no resources available

Targetry



High repetition operation

- Debris
- Target replacement
- Running costs

Advanced targetry

- Liquid jet
- Cryogenic targets
- Impact on target chamber requirements

Key outstanding challenges & risks

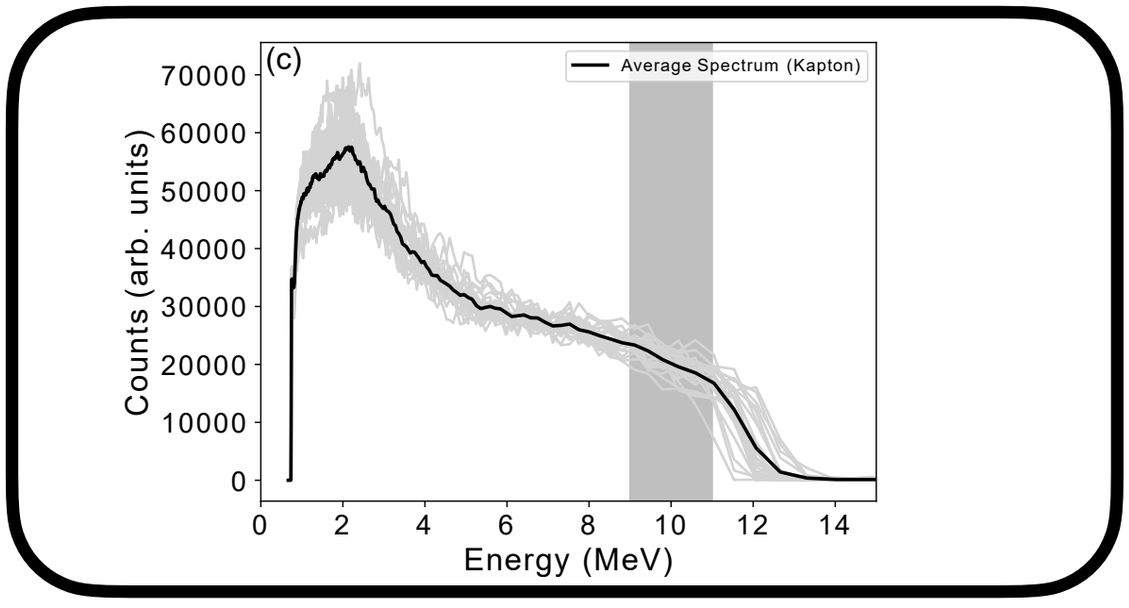
TNSA source stability

- Small scale variability with target/laser fluctuations
- Spatial modulation/ instabilities

Automation

- Fast diagnostic readout and feedback mechanisms

Source delivery



Z>1 ion parameters

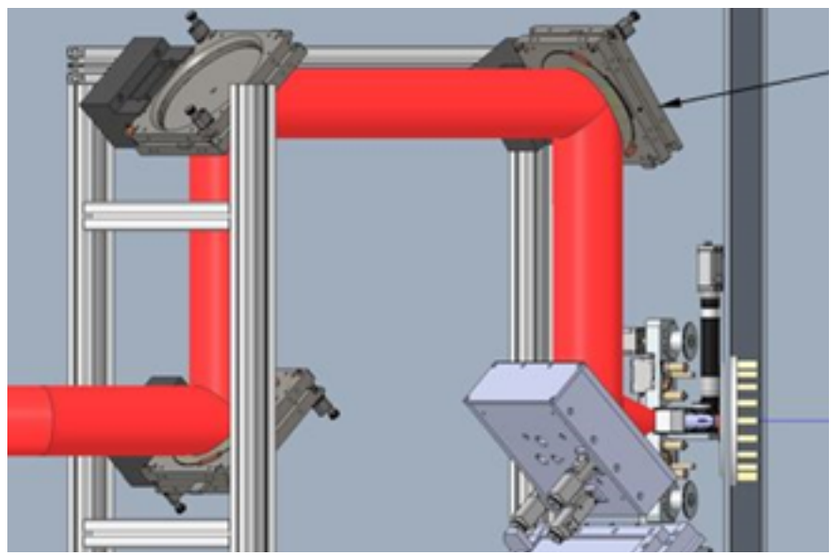
- Uncertainty over achievable flux / energies / ionisation state

Key outstanding challenges & risks

Infrastructure requirements

- Cryo/liquid targets can degrade vacuum in target chamber
- Laser specification will impact required footprint
- Source QA after beamline integration

Interface challenges



Secondary radiation generation

- Prompt electrons and x-rays
- EMP
- Activation