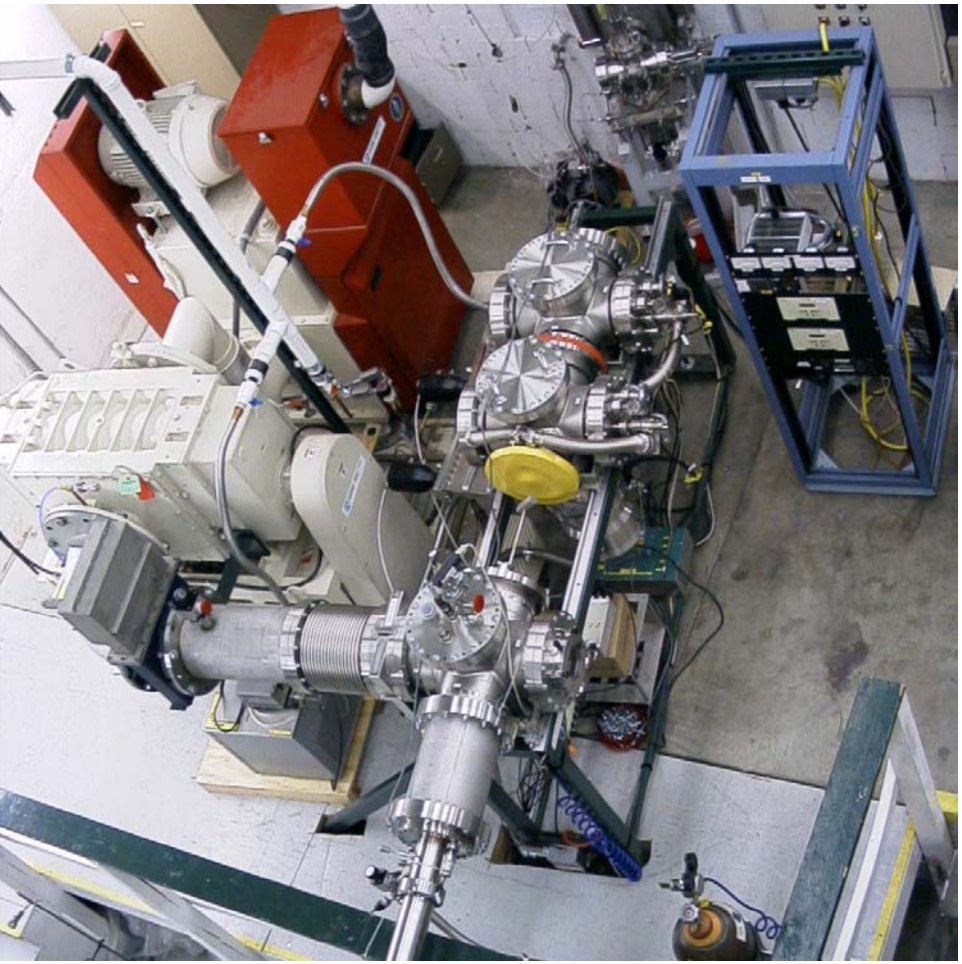
High Pressure Gas Cell

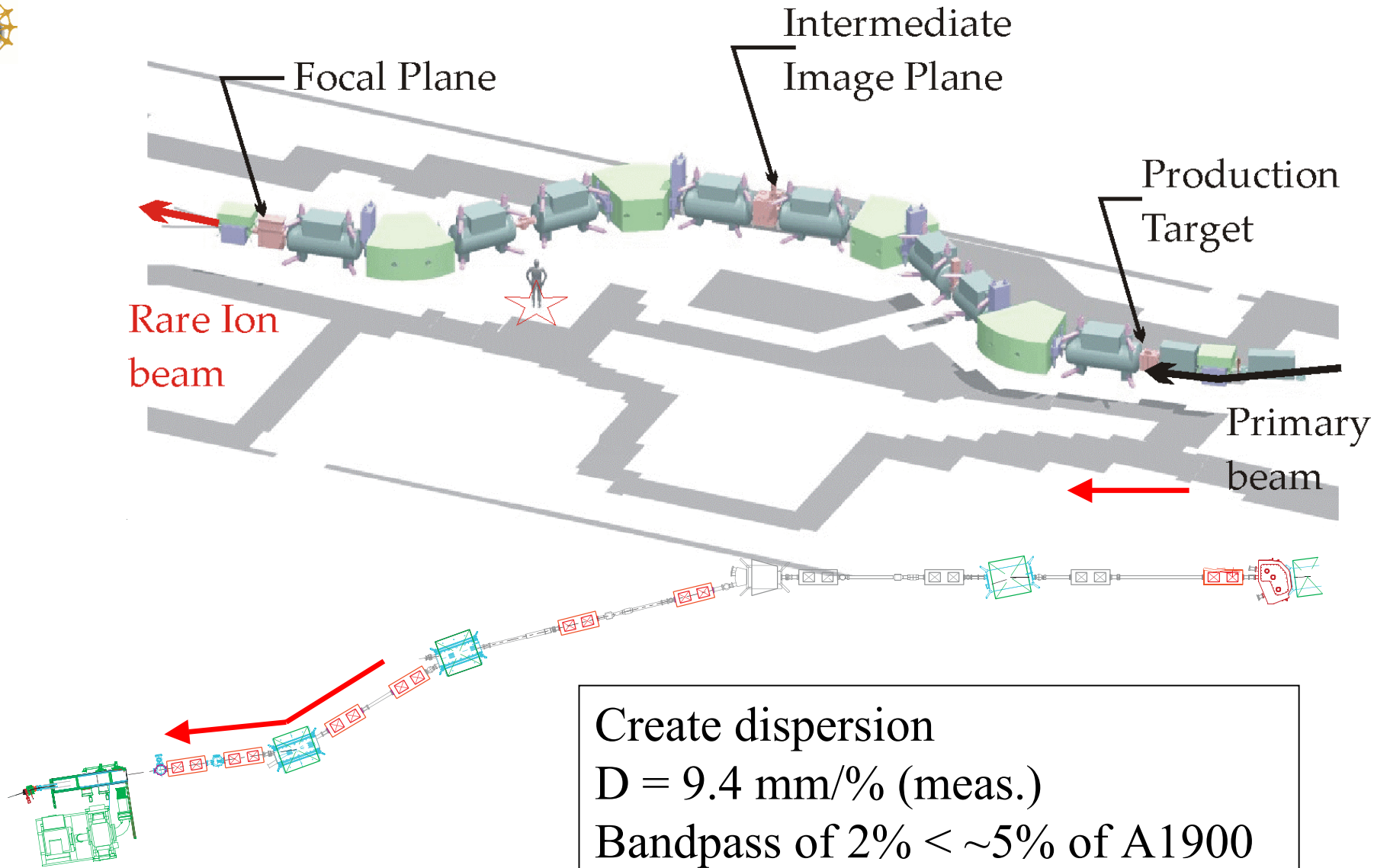
Determine the efficiency for capture and extraction of projectile fragments in one atmosphere helium



STATUS:

- UHV system done, ppb-gas supply manifold, nozzle flow measured
- High energy beamline, momentum dispersion, range compression demonstrated with beam and projectile fragments
- Extraction of projectile fragments recently demonstrated
- All electrode structures complete, Rf quadrupole ion-guides and skimmers complete (including rf-q for test setup at GSI)

Beam Creation & Transport

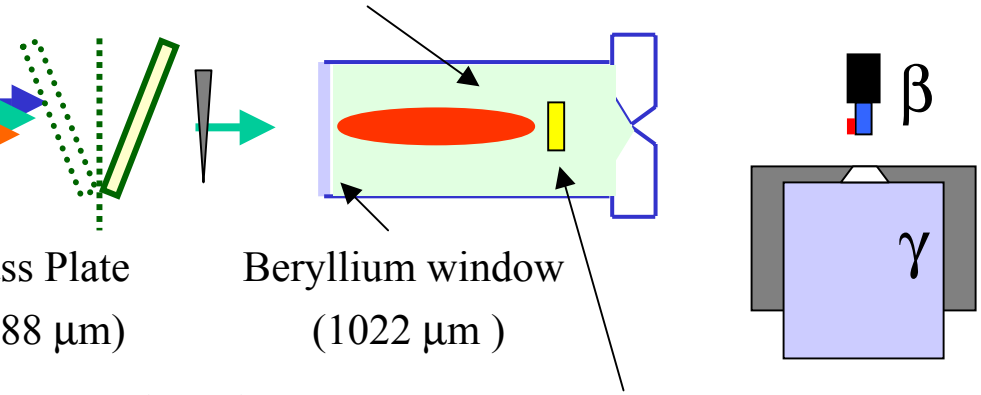


Create dispersion
D = 9.4 mm/% (meas.)
Bandpass of 2% < ~5% of A1900
(Limited by 10 cm diameter quads)

He gas (0, 780torr; 39.2cm)

Bρ=2.689Tm

Δp/p = 0.5 %



Glass Plate (1488 μm)

Beryllium window (1022 μm)

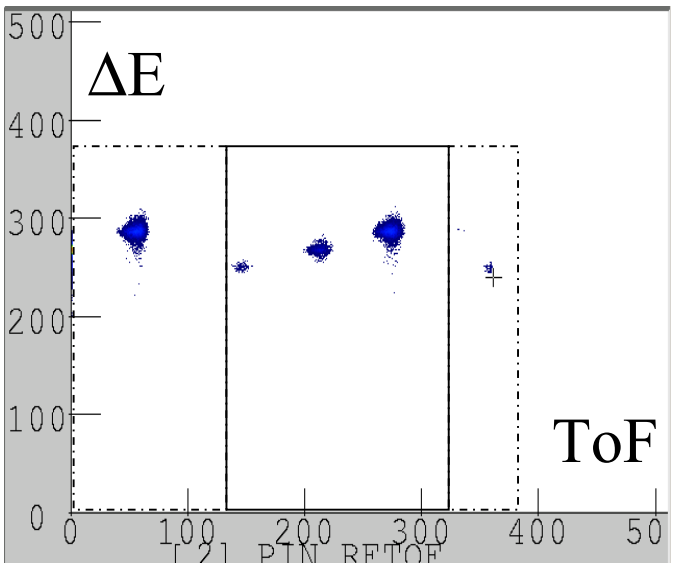
Al Wedge (750 μm, 2 mr)

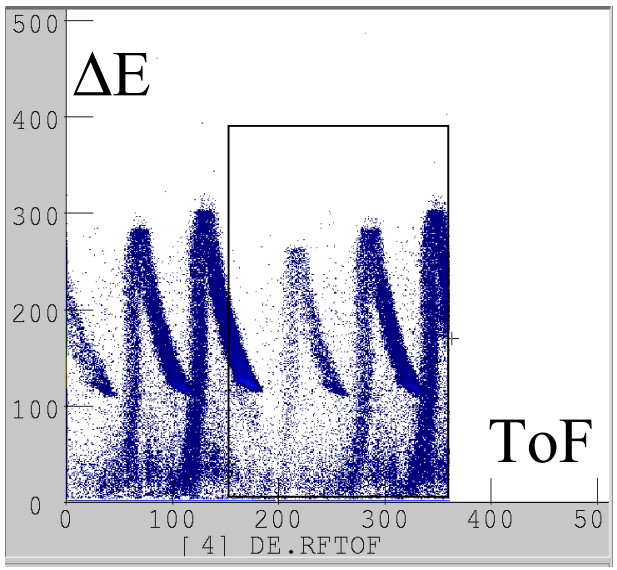
Removable Silicon detector (100 μm)

71% ^{38}Ca 3501 MeV

23% ^{37}K

6% ^{36}Ar





scan Glass degrader angle

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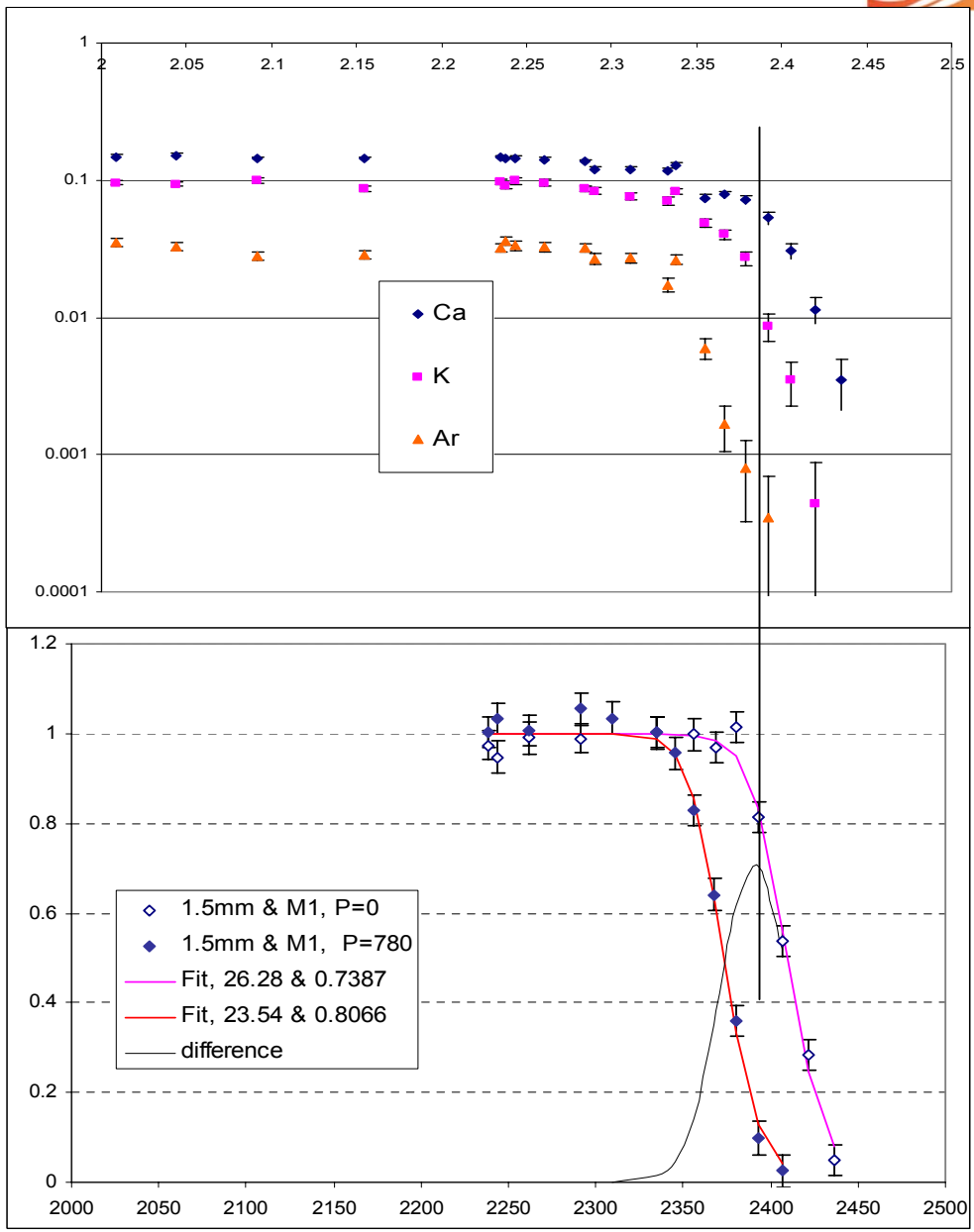
^{38}Ca Range Distribution

Monokinetic
1488 glass + 750 µm, 2mr Al
1022 µm Be window
0 or 780 torr He

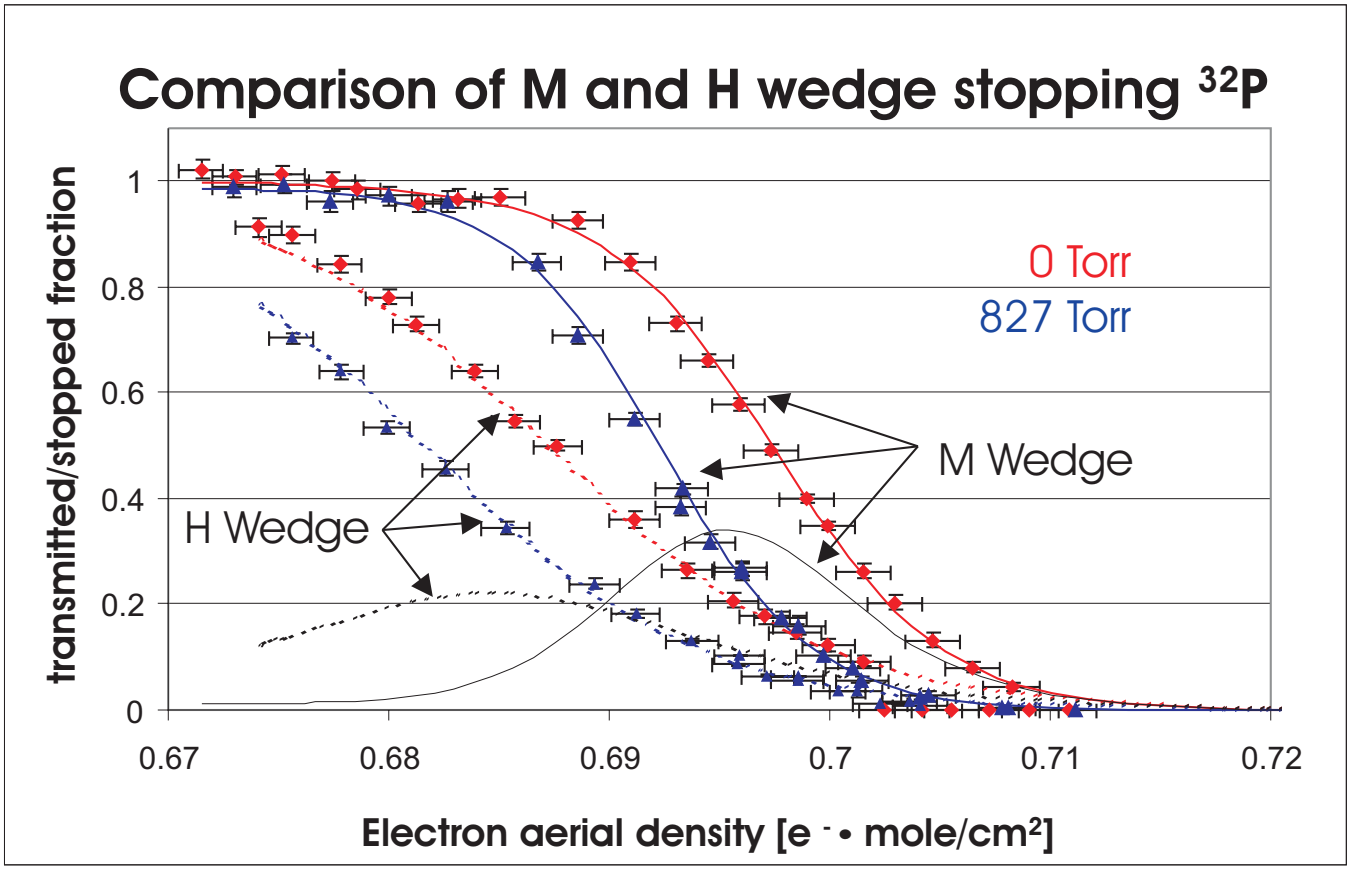
Normalized Rate

$$\frac{(N/Tgt.BaF_2)}{\langle (N/Tgt.BaF_2)\rangle_{0^\circ\to 20^\circ}}$$



Degrader thickness (µm)

^{32}P Range Distribution, Compression Example



Monokinetic (M) vs. Homogeneous (H)

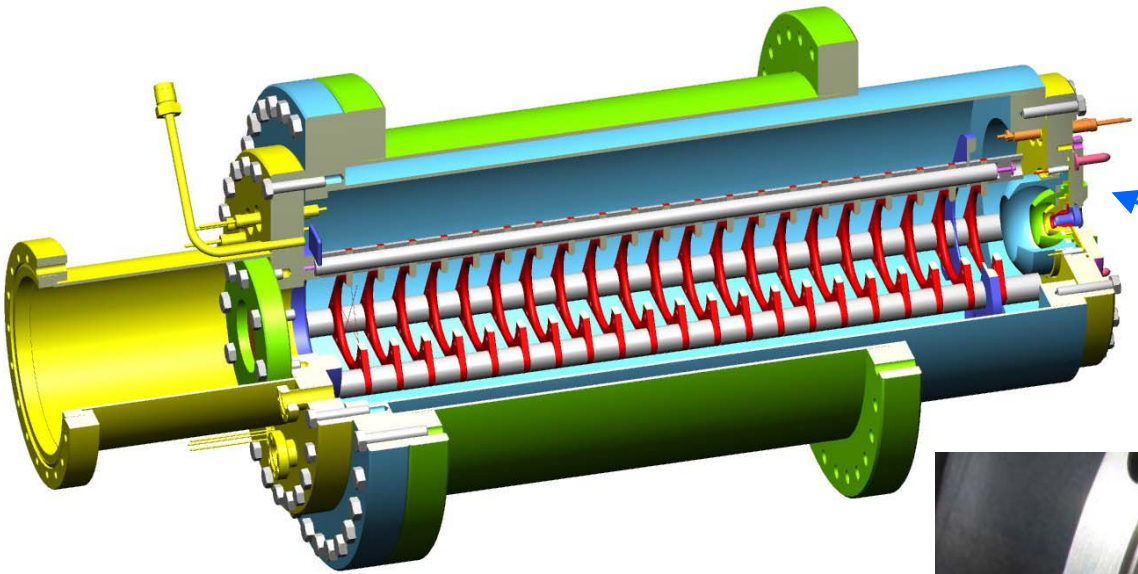
2976 glass + 750 μm, 10mr Al

1490 μm Be window

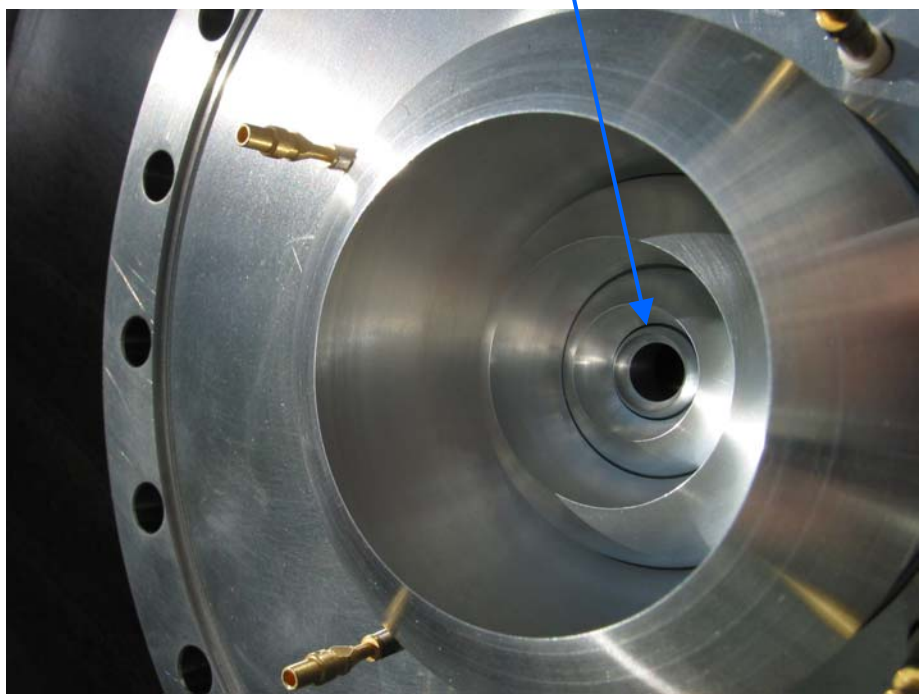
0 or 827 torr He

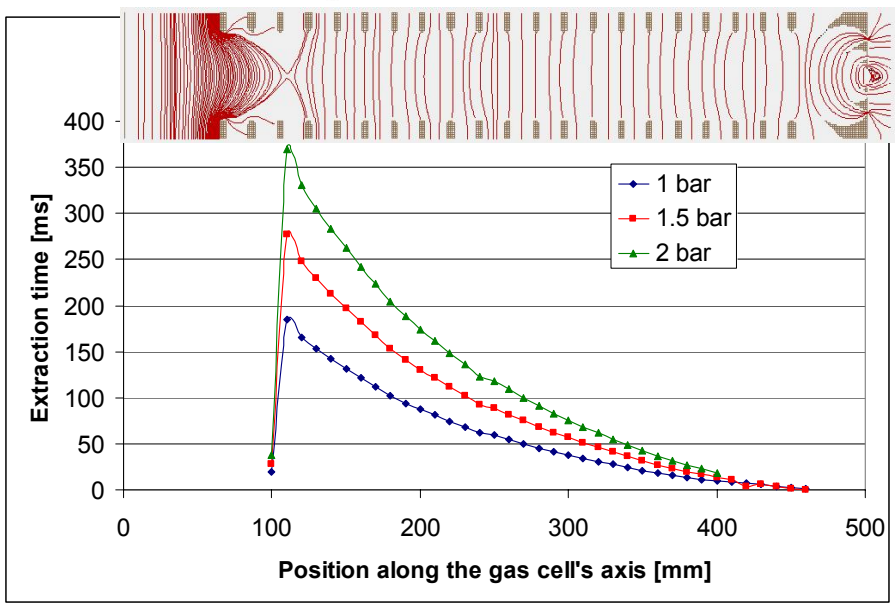
FWHM (M) = 110 μm glass

Electrodes for high pressure

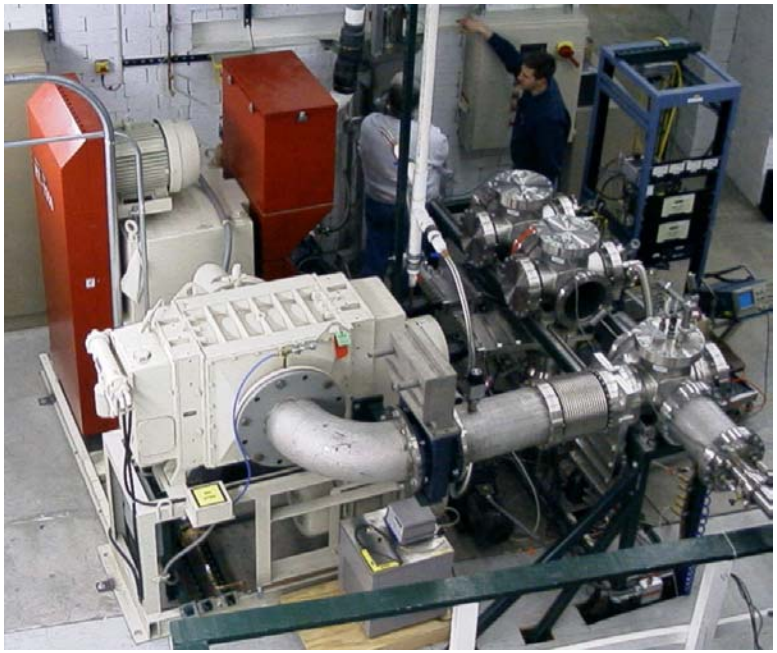


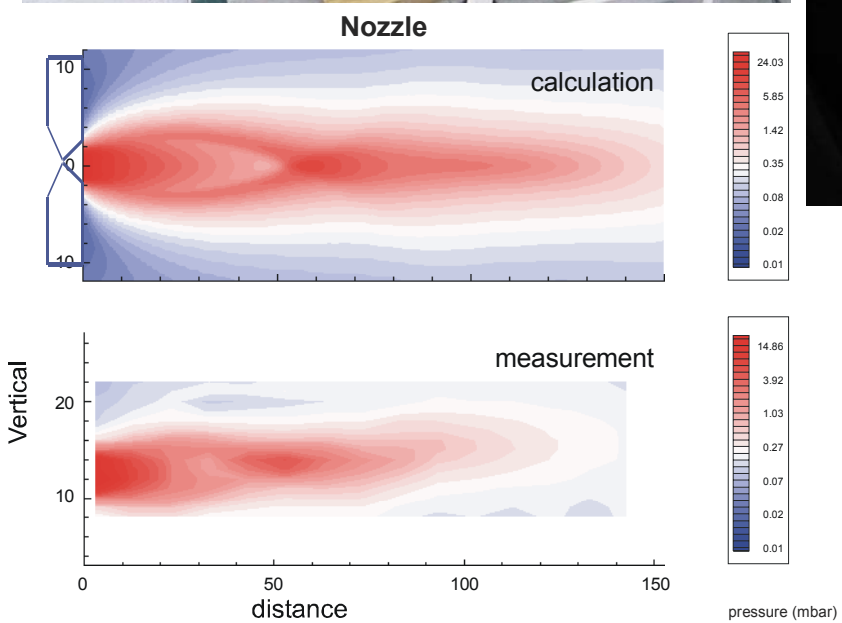
Silicon nozzle

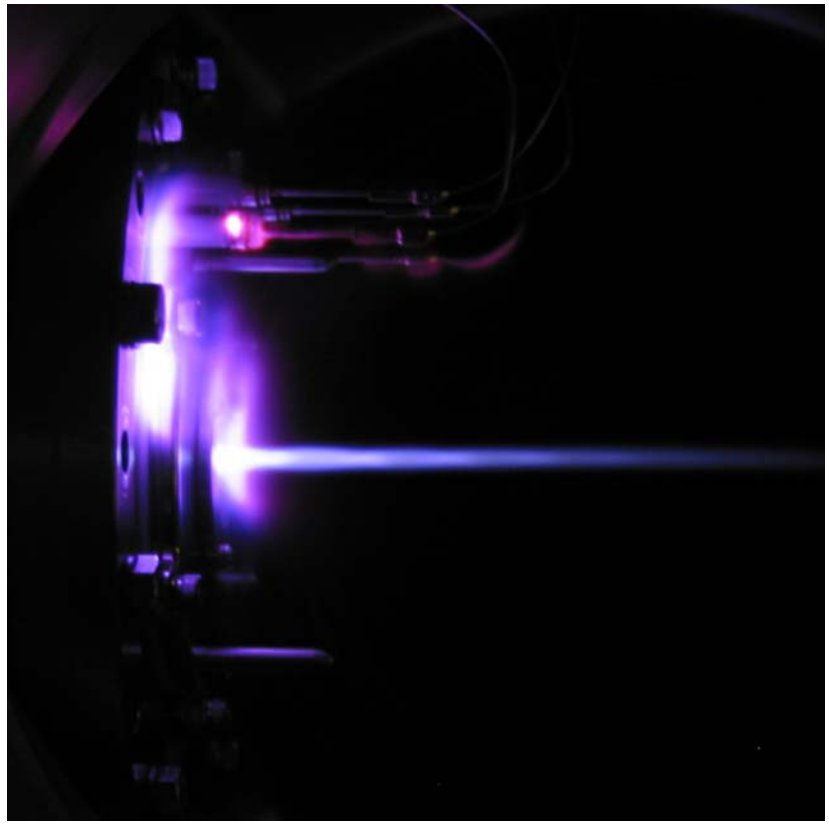


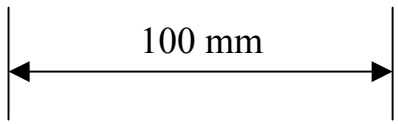


Gas Jet & Nozzle Flow



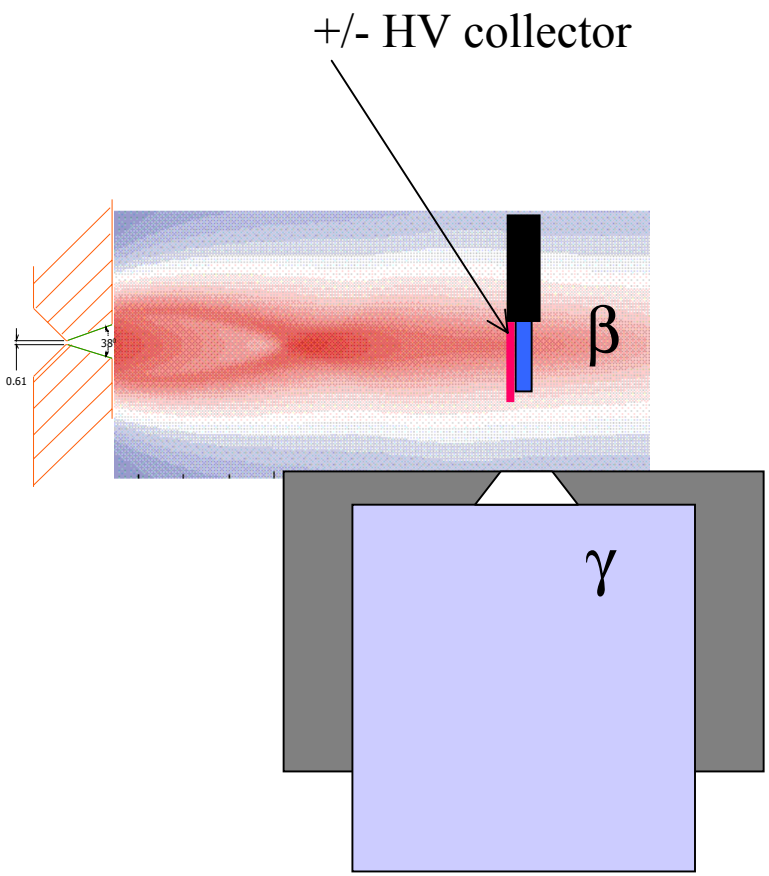


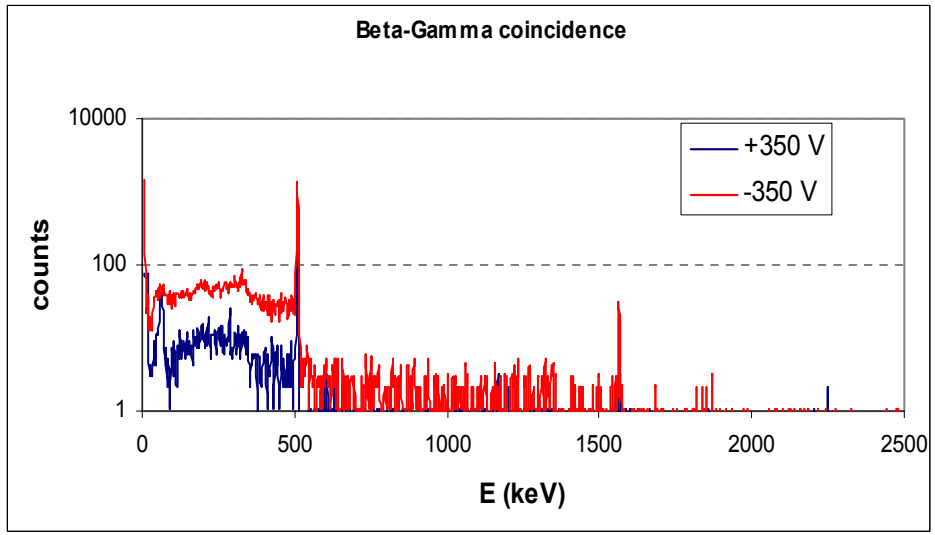


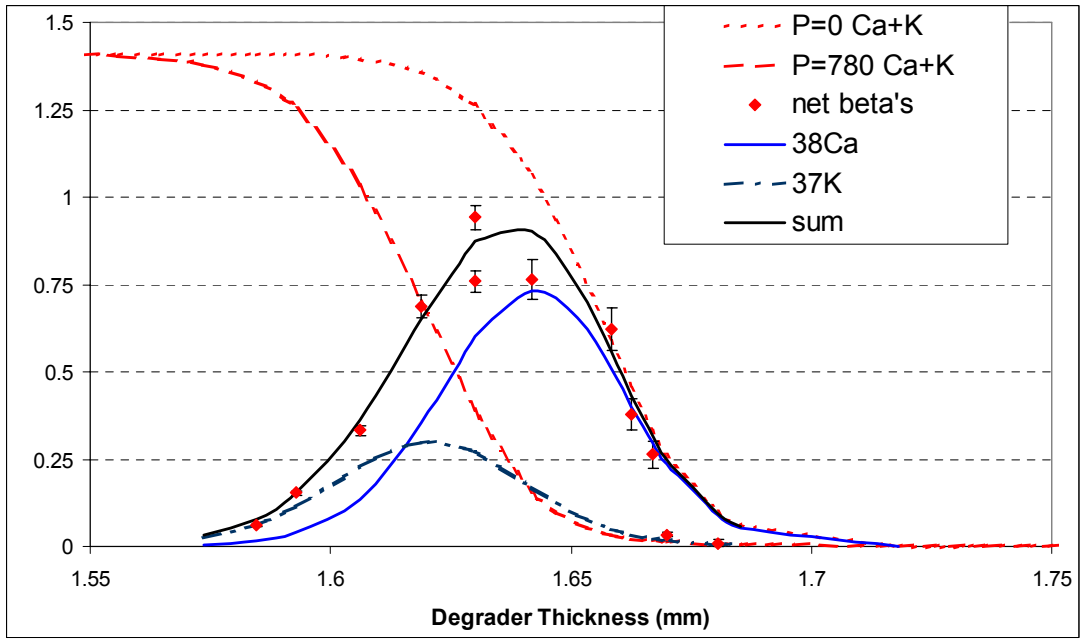


Helium jet under glow discharge

^{38}Ca extraction, first preliminary results







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Summary

•Complete system constructed, all components tested and characterized

•High energy beamline, momentum dispersion, range compression demonstrated with various projectile fragments

e.g. ^{32}P @ 113 MeV/A with 2% $\Delta p/p$

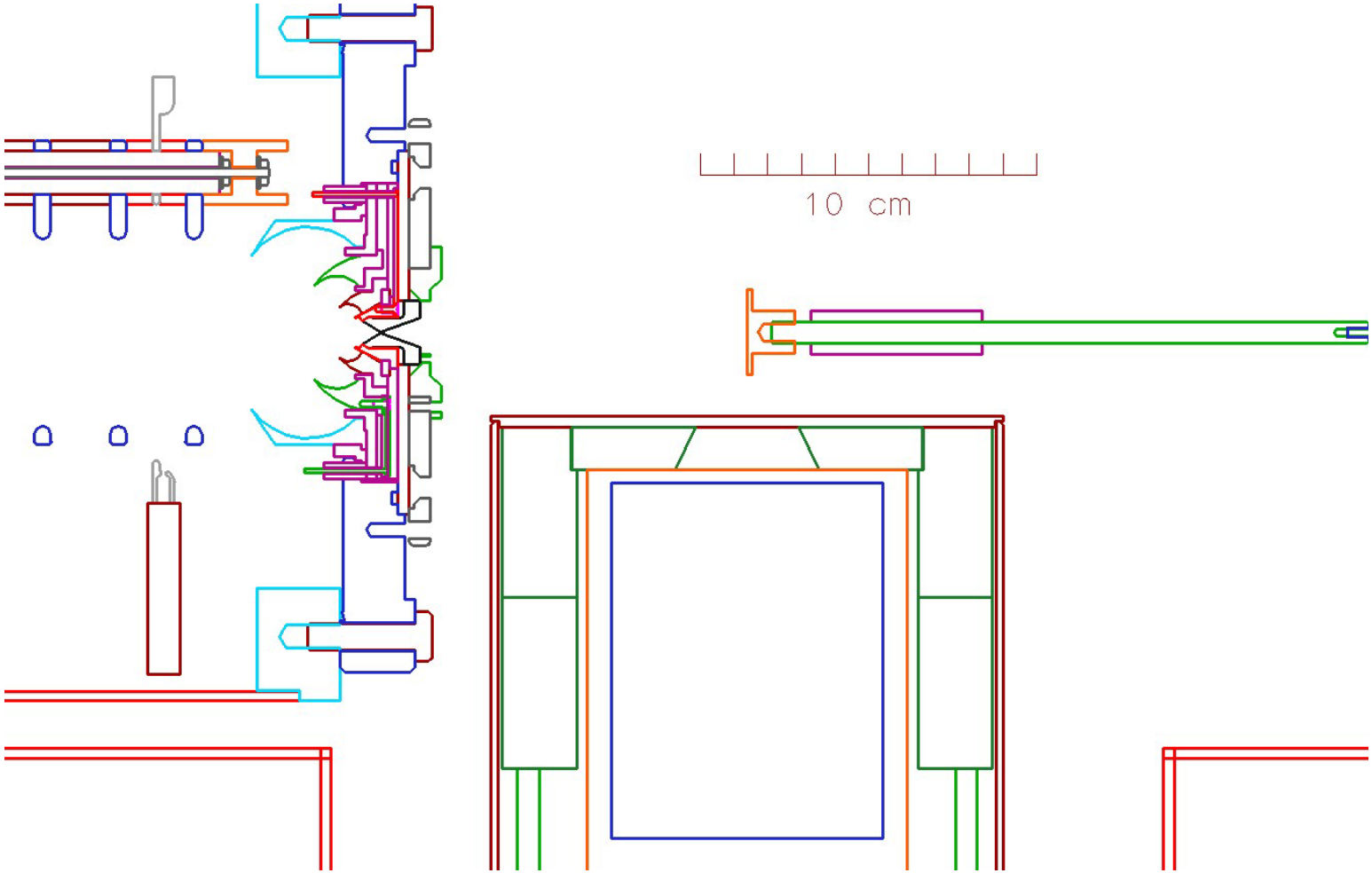
•Extraction of ^{38}Ca projectile fragments recently demonstrated at the level of roughly 1%

•Optimization & understanding of extraction efficiency underway!

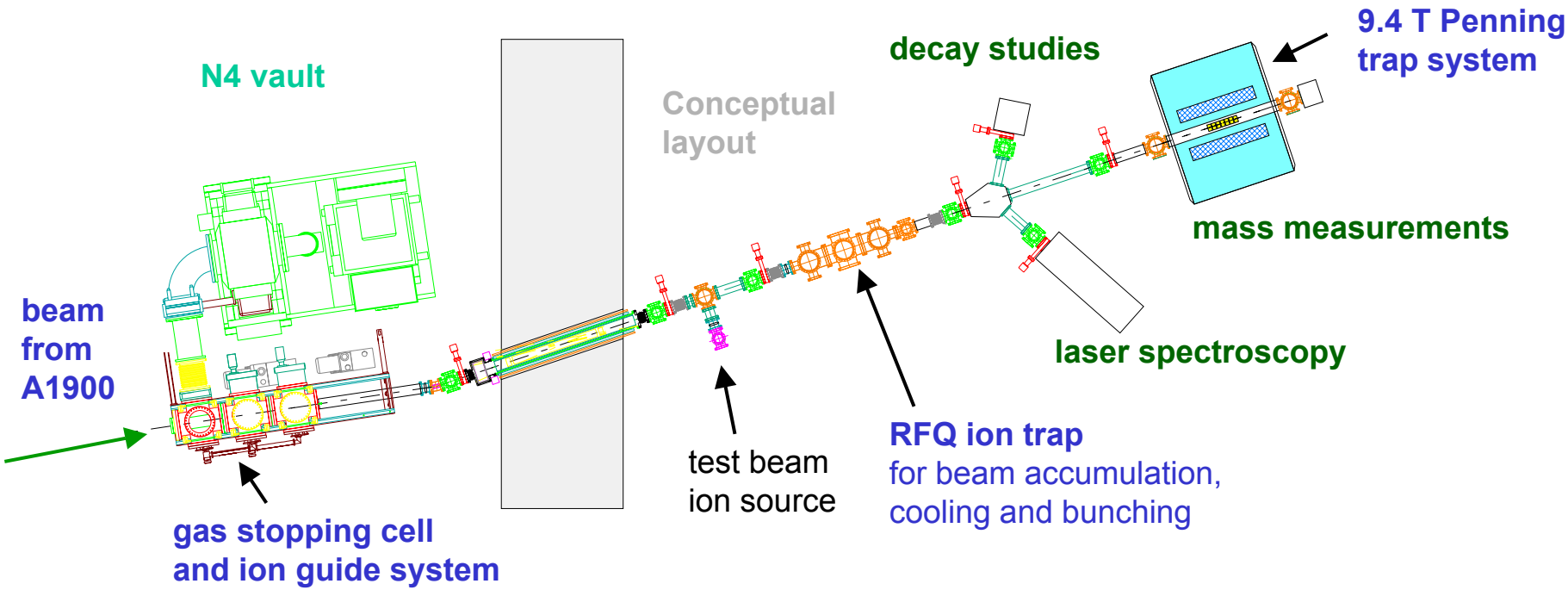
Studies with implantation rate, focusing electrode voltages planned for later in Fall/2oo3 at the NSCL

[Collaboration with ANL on GSI gas cell expected to continue]

Extraction geometry



Low energy beam and ion trap project at NSCL



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