CARIBU and ATLAS Status and Operation

Workshop on:
Decay Spectroscopy at CARIBU: Advanced Fuel Cycle Applications, Nuclear Structure and Astrophysics
April 14-16, 2011

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CARIBU Today

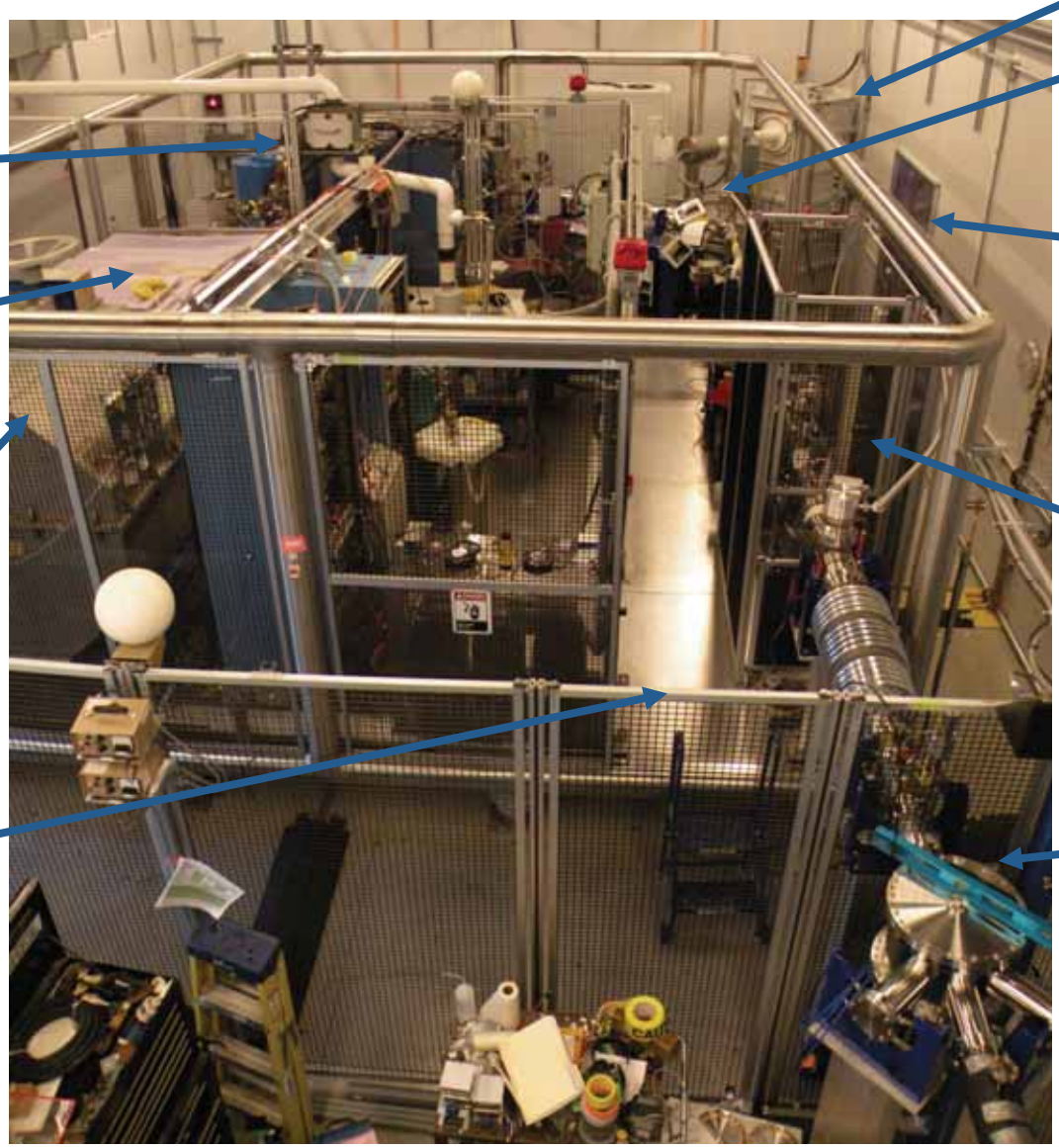
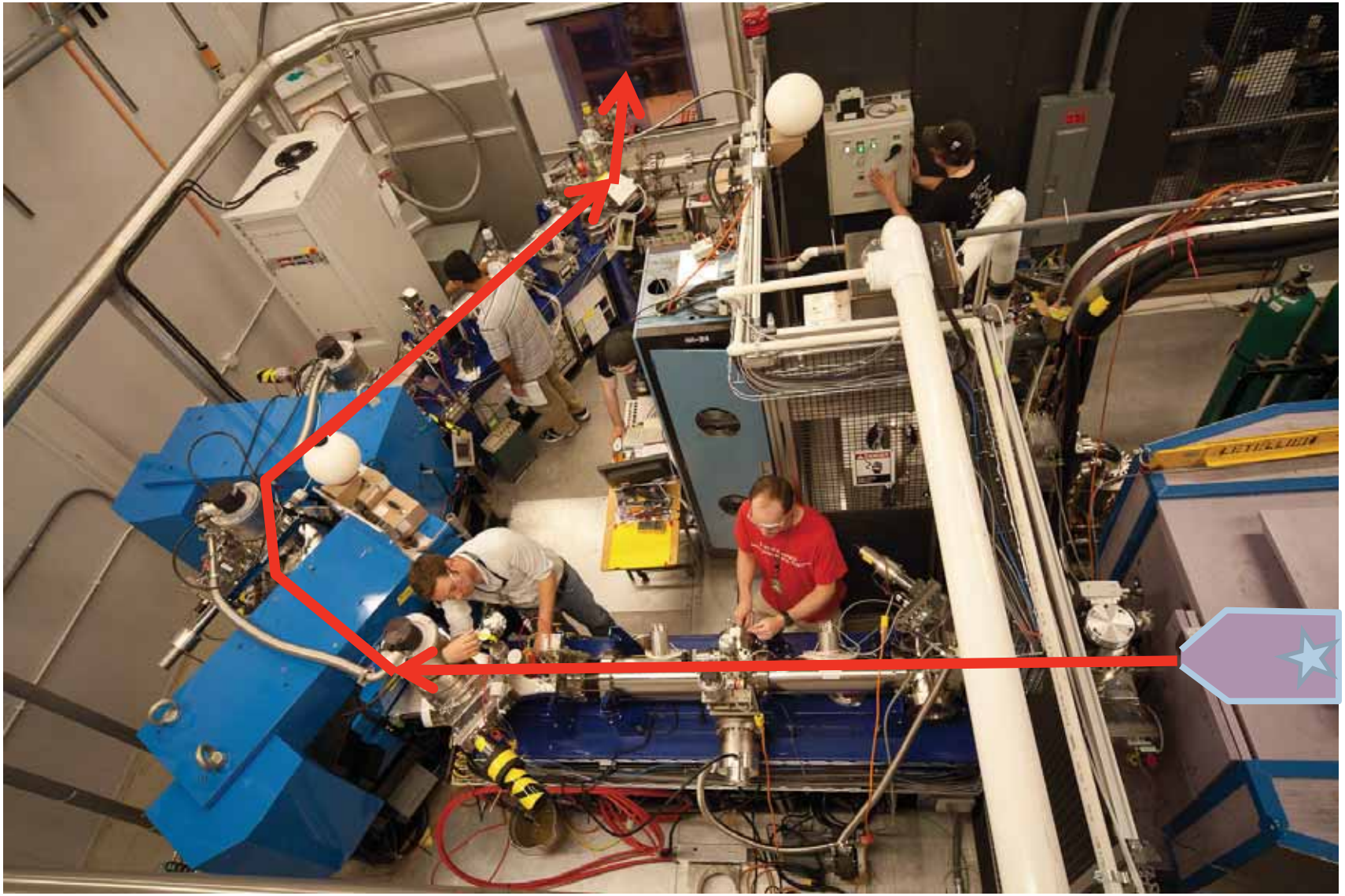


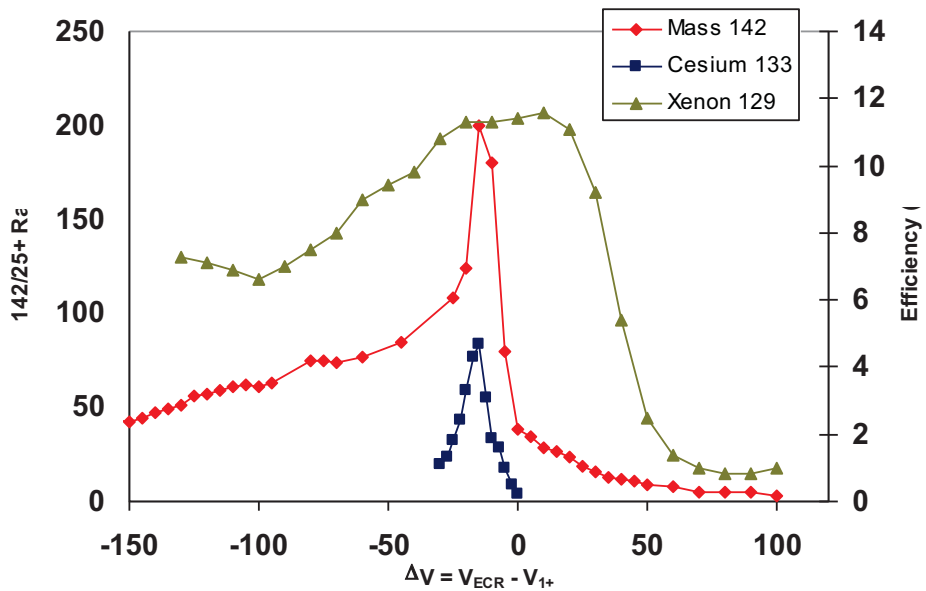
Photo of CARIBU w/ beam path overlay



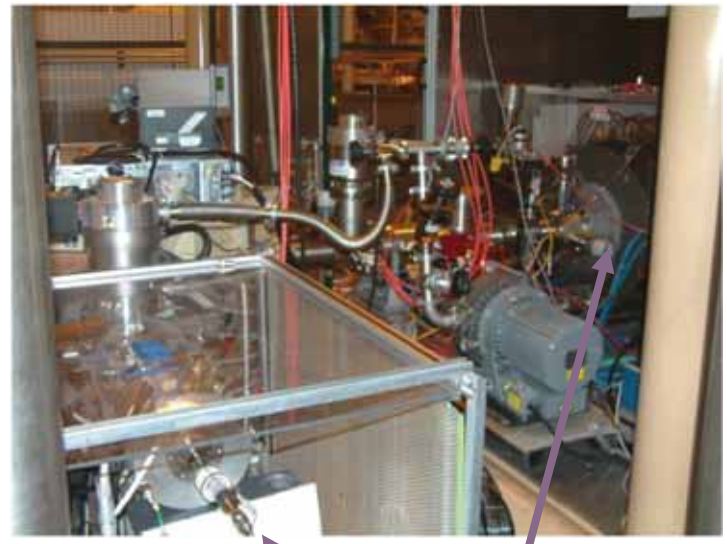
ECR Charge Breeder Results

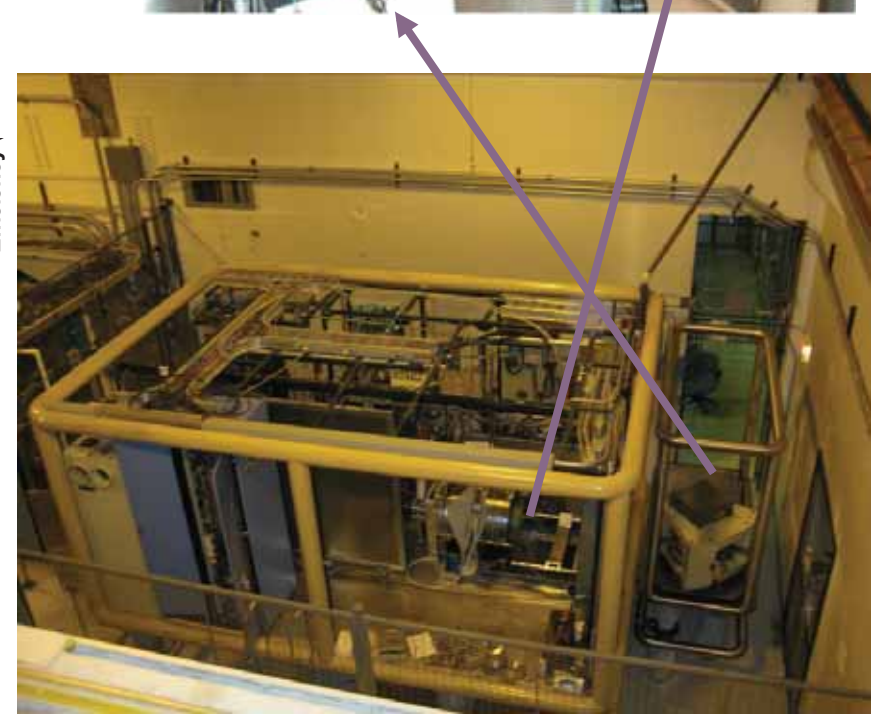
In order to accelerate beams in ATLAS the charge-to-mass ration (q/m) must be raised to >1/8 (depending on the desired energy).

For A=143 → q > 18

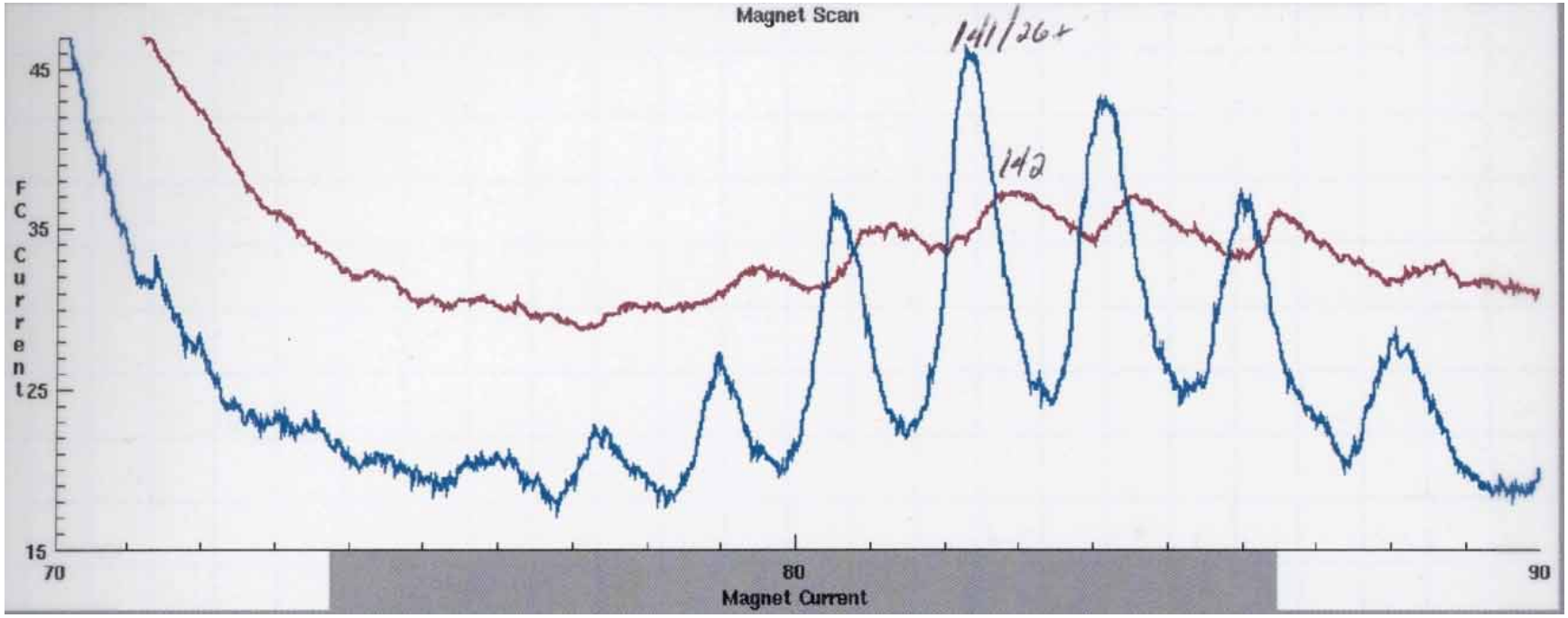


Rate and Efficiency for Mass 142/25+, $^{129}Xe^{25+}$ and $^{133}Cs^{26+}$ as function of Voltage difference between ECRCB & 1+ source





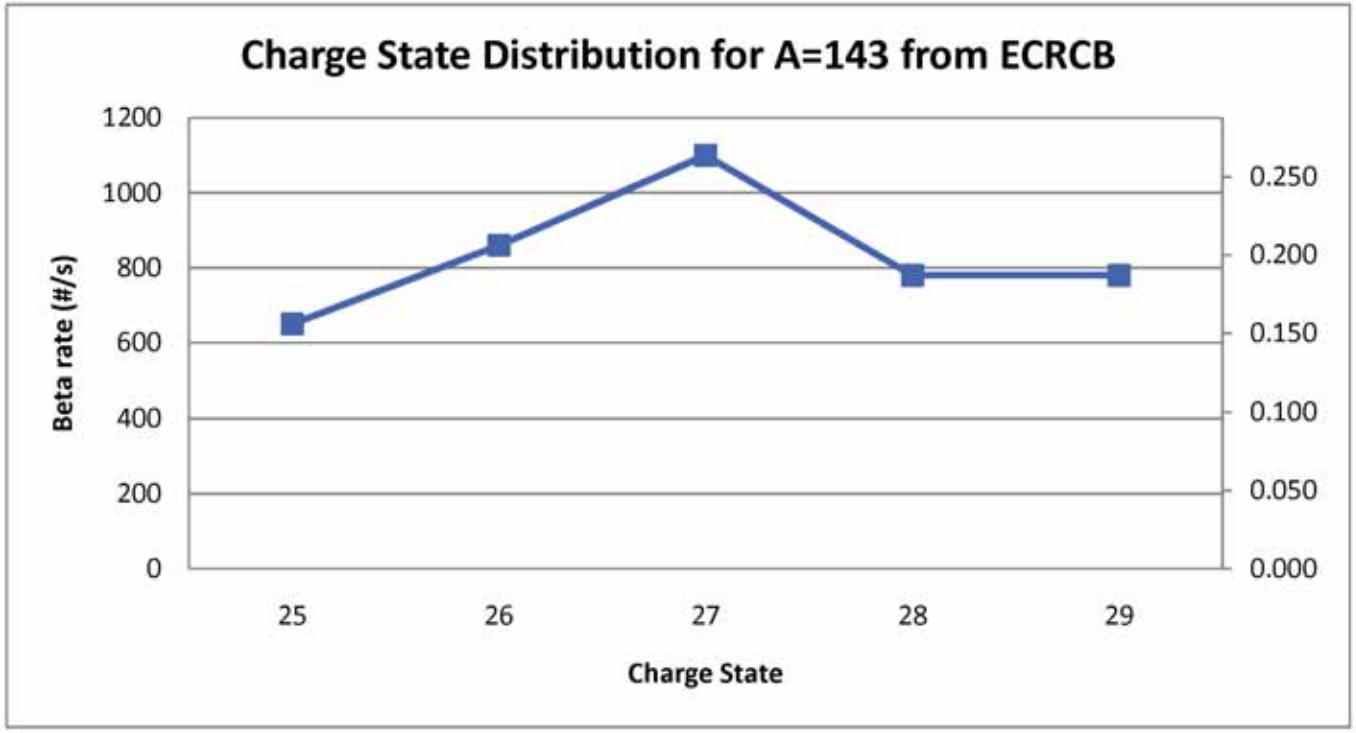
ECR Charge Breeder Results



Rigidity scans for mass 141 & 142 using β decay detection.

Best breeding efficiencies: 11-15% for gases, solid, & RIBs.

ECR Charge Breeder Results



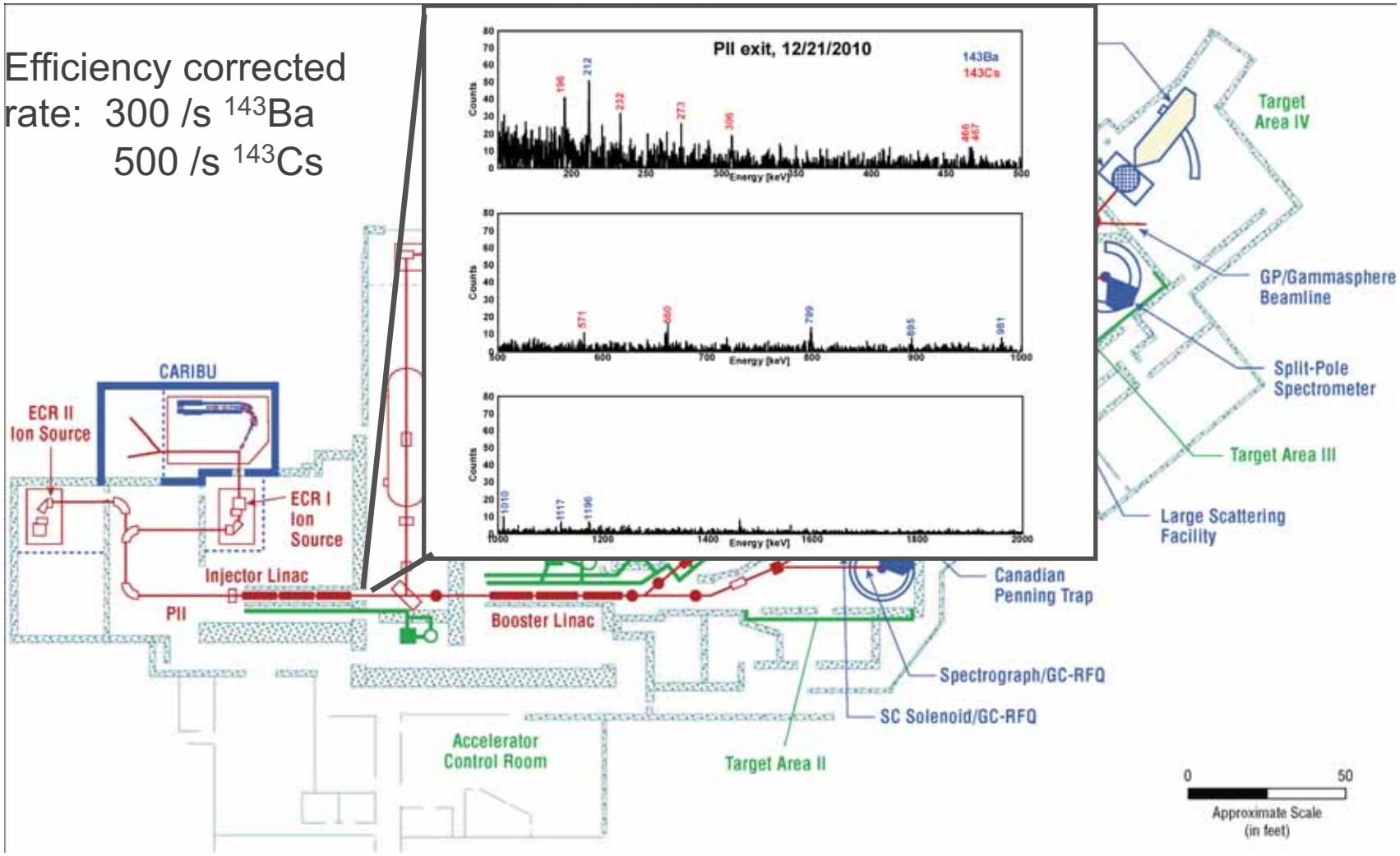
Best breeding efficiencies: ~11-15% for gases, solid, & RIBs.

Accelerator Configuration for Weak Beams

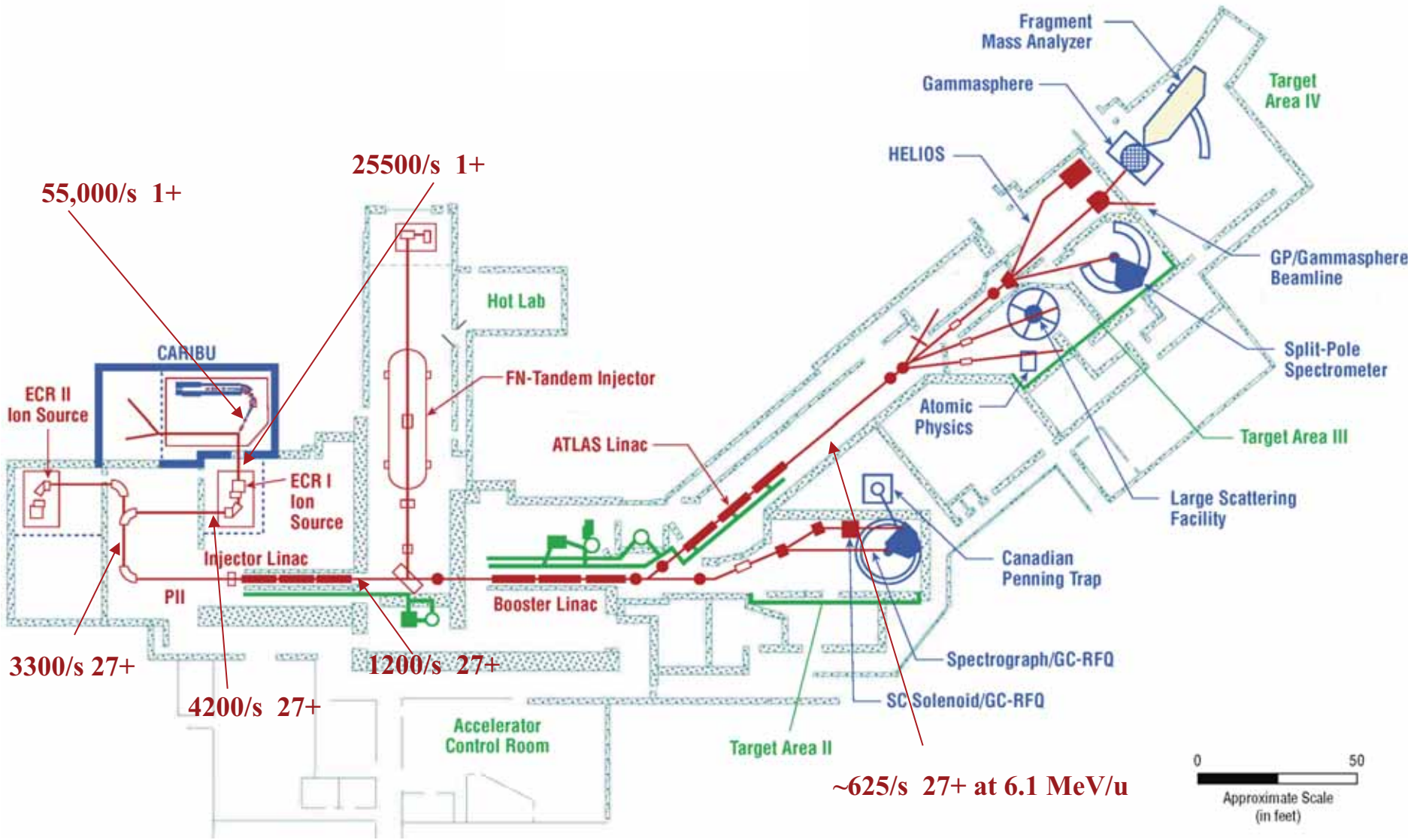
- Initial tune of accelerator performed with a 'guide' beam of similar (q/m) ratio.
  - For $^{143}Ba^{27+} \rightarrow$ q/m= 0.18892
  - Guide beam of $^{132}Xe^{25+} \rightarrow$ q/m = 0.18954
  - So the scale factor to ^{143}Ba is 1.00329

Accelerated Mass 143 Beam at PII Exit, December 2010.

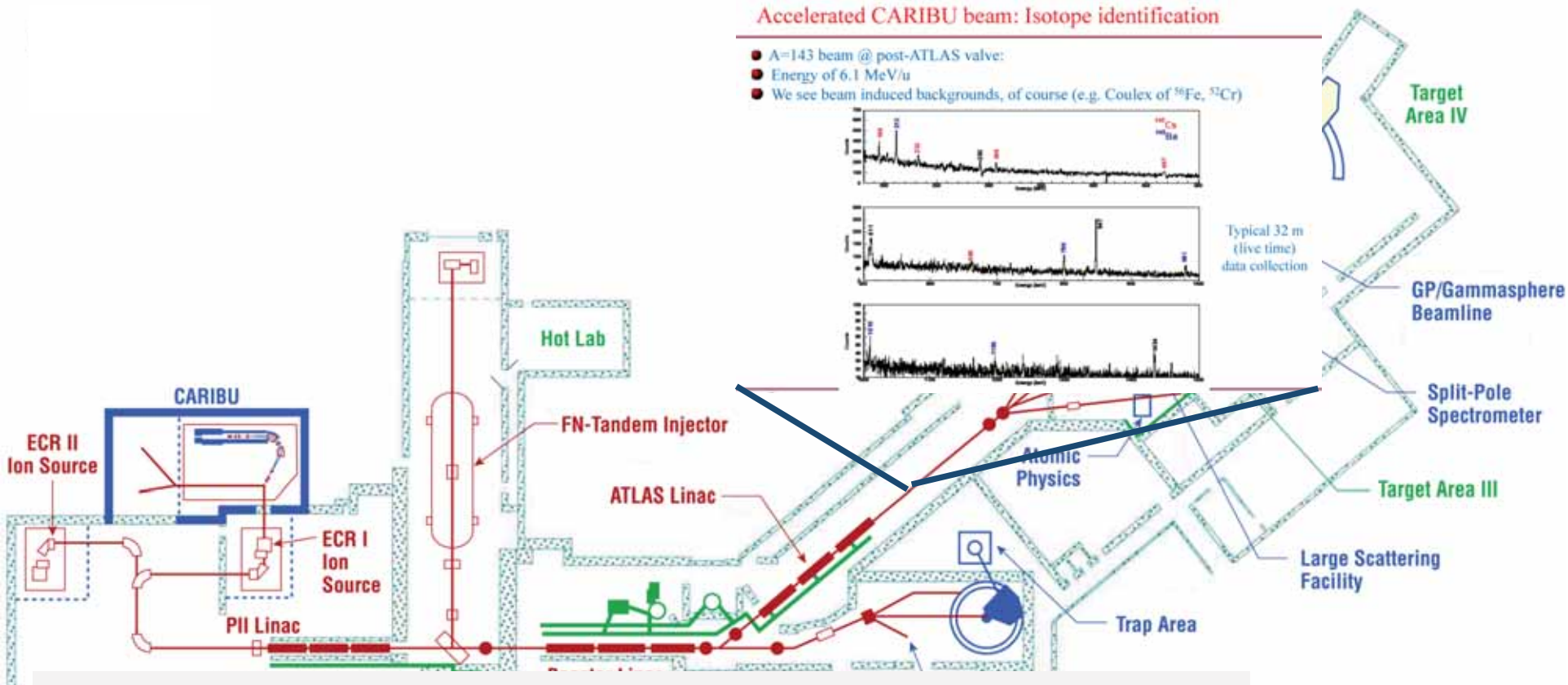
Efficiency corrected rate: 300 /s ^{143}Ba
500 /s ^{143}Cs



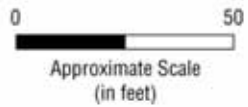
^{143}Ba and ^{143}Cs accelerated to 6.1 MeV/u on March 15, 2011



CARIBU Operating Status



- A=143, q=27+ accelerated to 6.1 MeV/u
  - Not sufficient ^{143}Ba for commissioning
  - Hope to complete at end of April
  - 25% acceleration efficiency (should be 65%)
- 141-146 Cesium masses measured in trap



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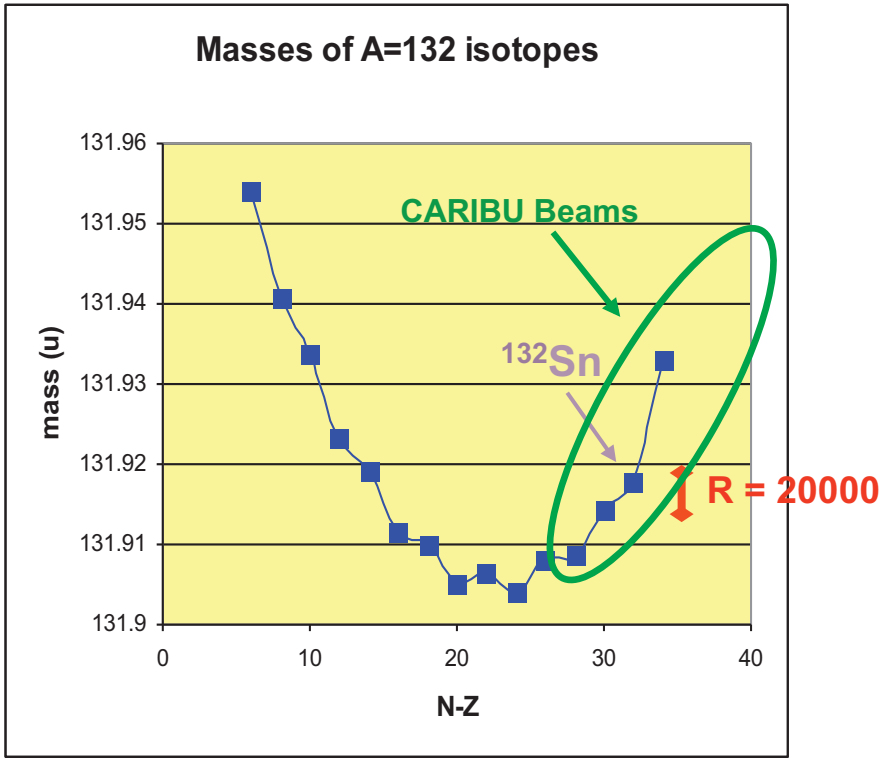
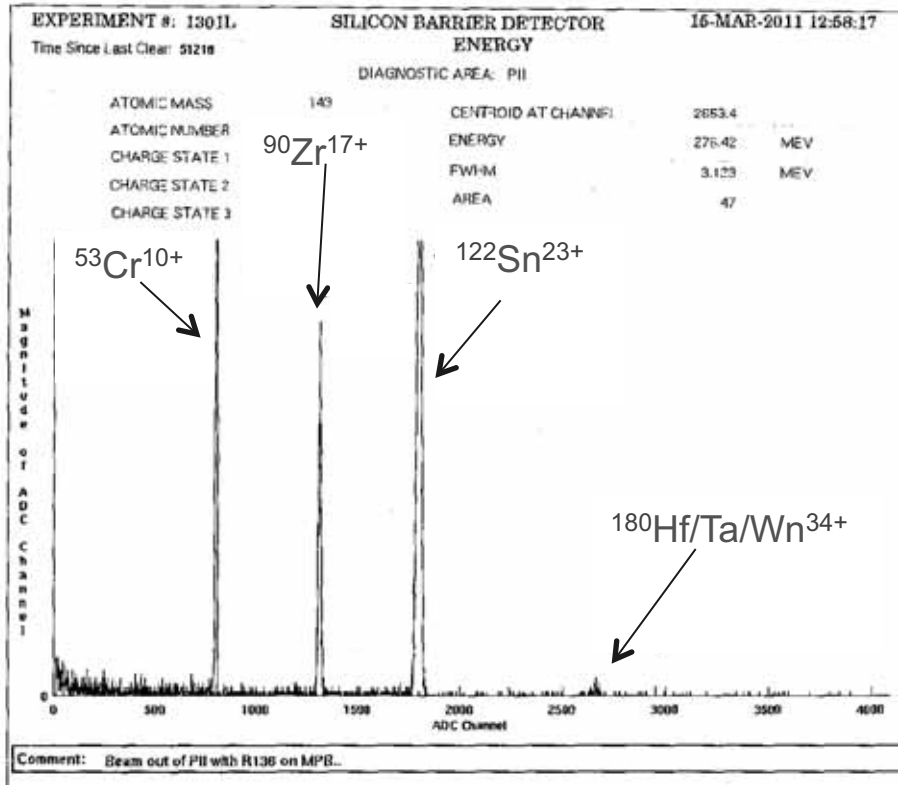
Beam Contaminants for accelerated CARIBU Beams

Two sources of beam contaminants:

1. Degenerate isobars not separated by Isobar Separator.



2. Stable beams with the same q/m ratio as beam of interest.



Next Steps

April 27-May 1: Next CARIBU acceleration test to achieve commissioning goals

- Need at least 400 ^{143}Ba /s @ 6 MeV/u at ATLAS Diagnostics region.
- Deliver RIB beam to target facility and reach sufficient intensity for initial test experiment.
    - Improved weak beam diagnostics to allow beam tuning and optimization