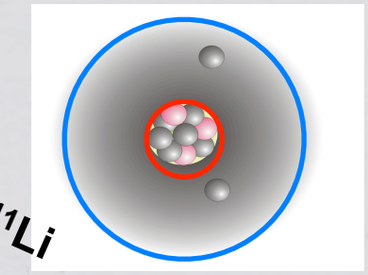
TITAN APRIL '09 BEAM TIME

Exp. S1158: Mass determination of ^{12}Be and others

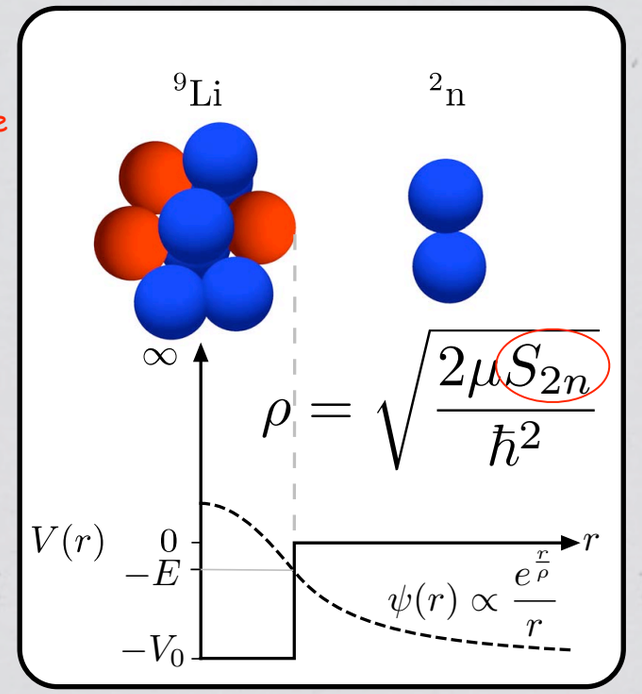
Precision mass measurement for halo studies



Halo "=" R_{Matter} - R_{Charge}

Important for: ^{11}Li

* Separation energy: $S_n(N,Z) = M(N-1,Z) + M_n - M(N,Z)$
* Charge radius calculation: I.S. = M.S. + F.S.(r_c)

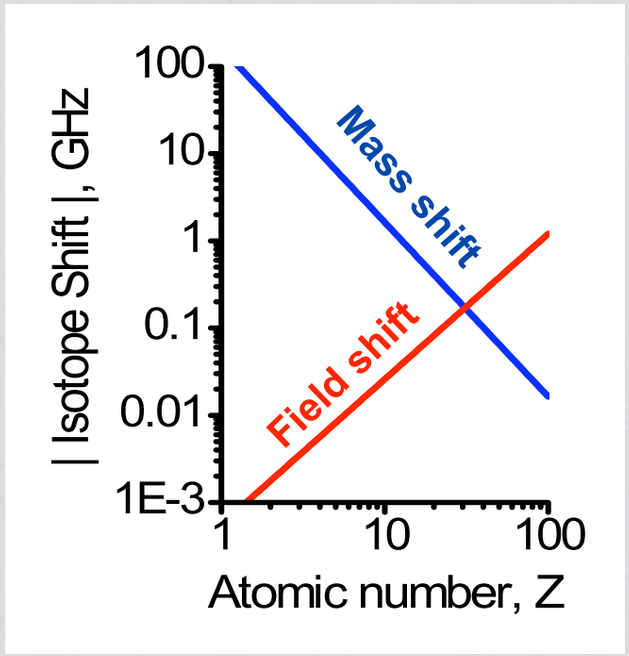


Main goals for the beam time:

* Re-measure ^{11}Be mass
* Measure ^{12}Be mass
* If possible, measure ^{14}Be mass

Optional measurement:

* Charge breeding of RIB



One-neutron halo: ^{11}Be

R. Ringle *et al.* Phys. Lett. B 675, 170 (2009)

* Re-measure ^{11}Be mass ✓
* Measured under different conditions:
  different calibration specie
  excitation time

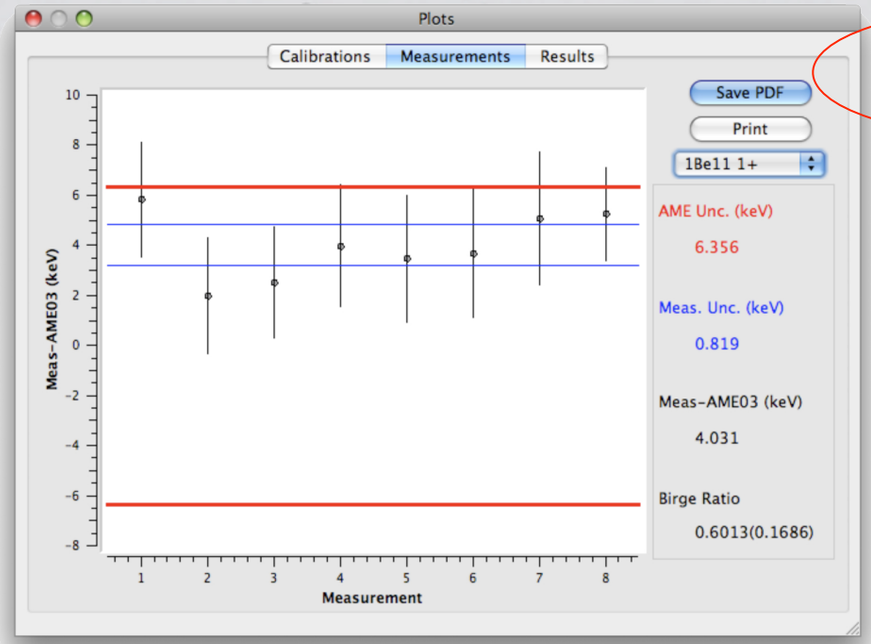
$$\frac{\delta m}{m} = \frac{m}{qTB\sqrt{N}}$$

trapping voltage

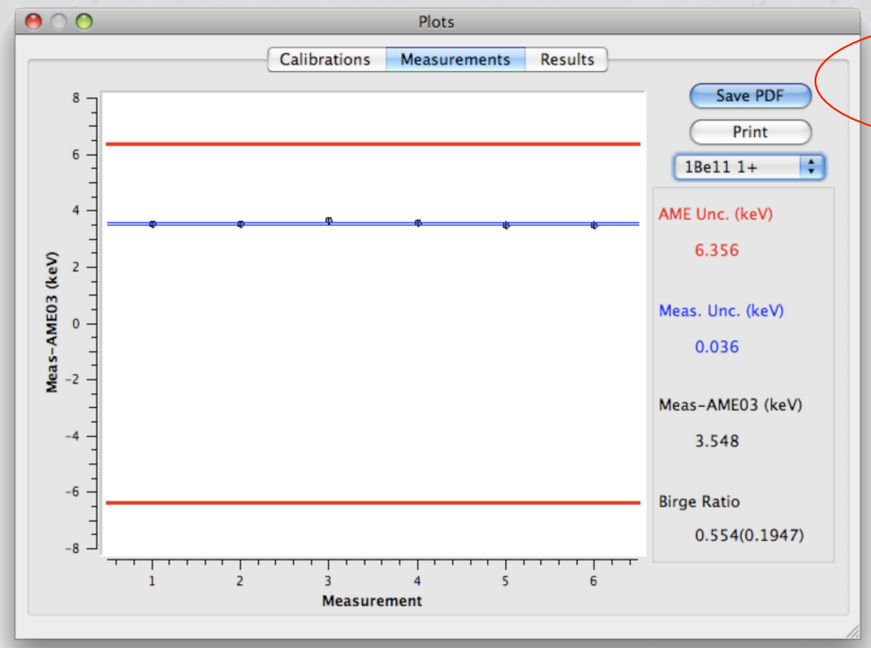
* Give comparable value:

’09 - ’08 mass = 0.5(1.0) keV

We are consistent!



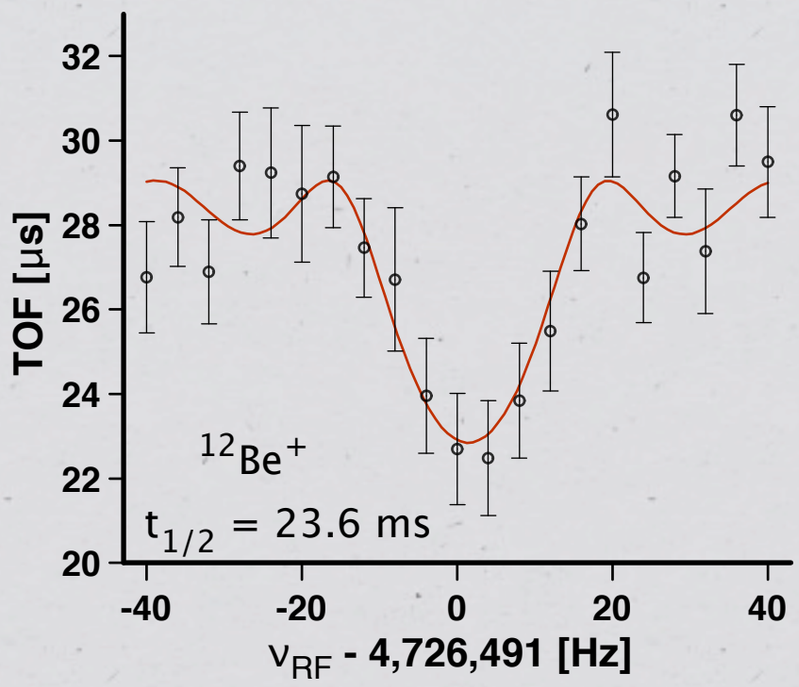
April 4th, 2009
^{11}Be vs. ^{12}C
17 ms excitation
ME = 20178.1(8)

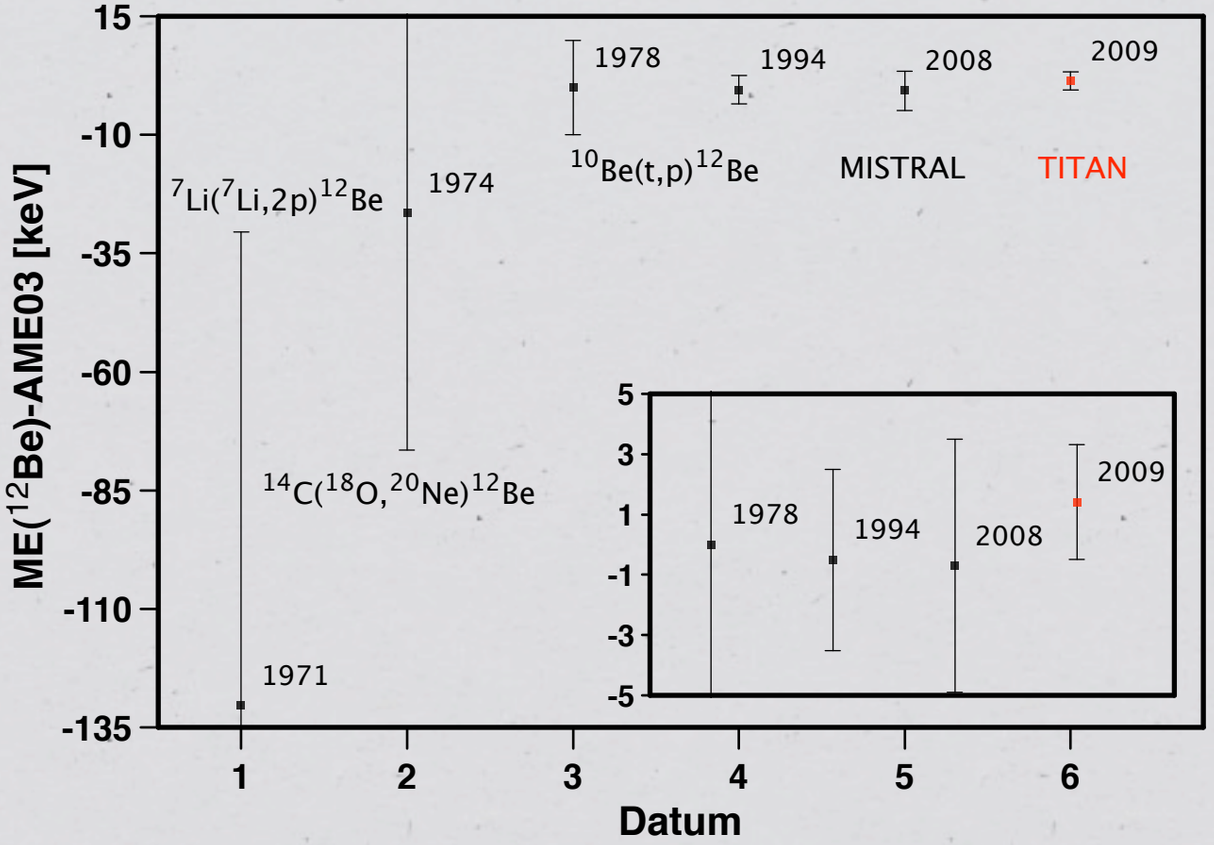


May 6th, 2008
^{11}Be vs. ^{7}Li
997 ms excitation
ME = 20177.612(36){570}

^{12}Be mass measurement

* Measure ^{12}Be mass ✓

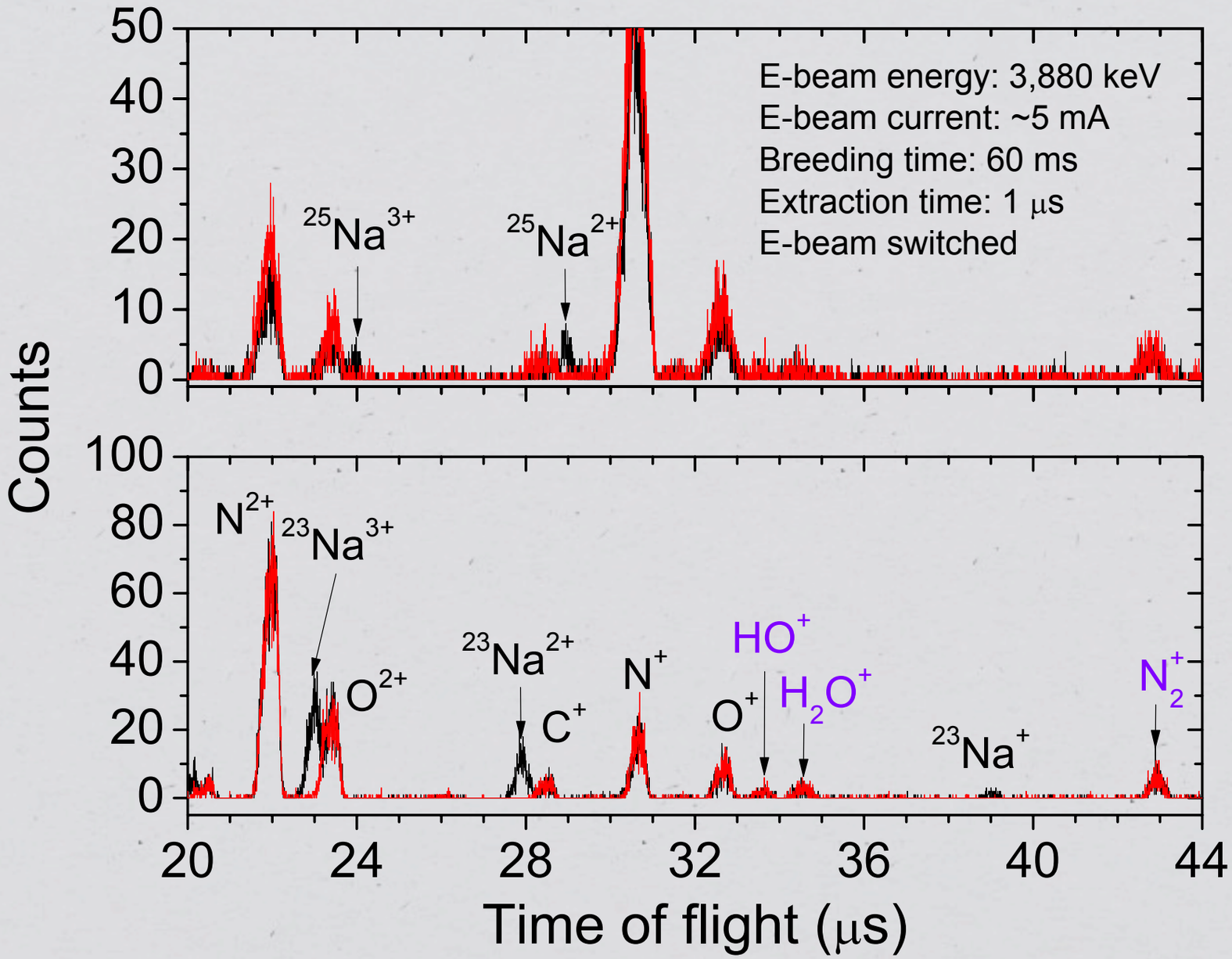




* Very short half life (23.6 ms)
* Very low yields (30 - 300 counts/s)
* Possible candidate for laser spectroscopy
* IMME re-evaluation for A = 12 quintet

Charge breeding of Na-25

* Charge breeding of RIB ✓



Red: Beam off

(residual gas)

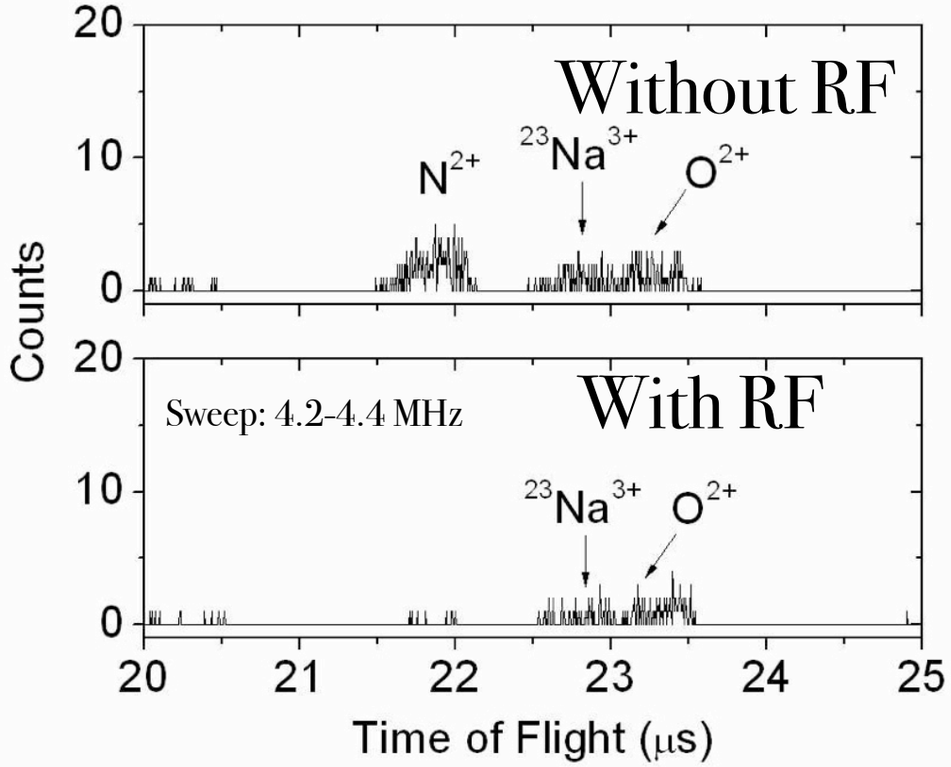
Black: Beam on

Dipole cleaning in the EBIT

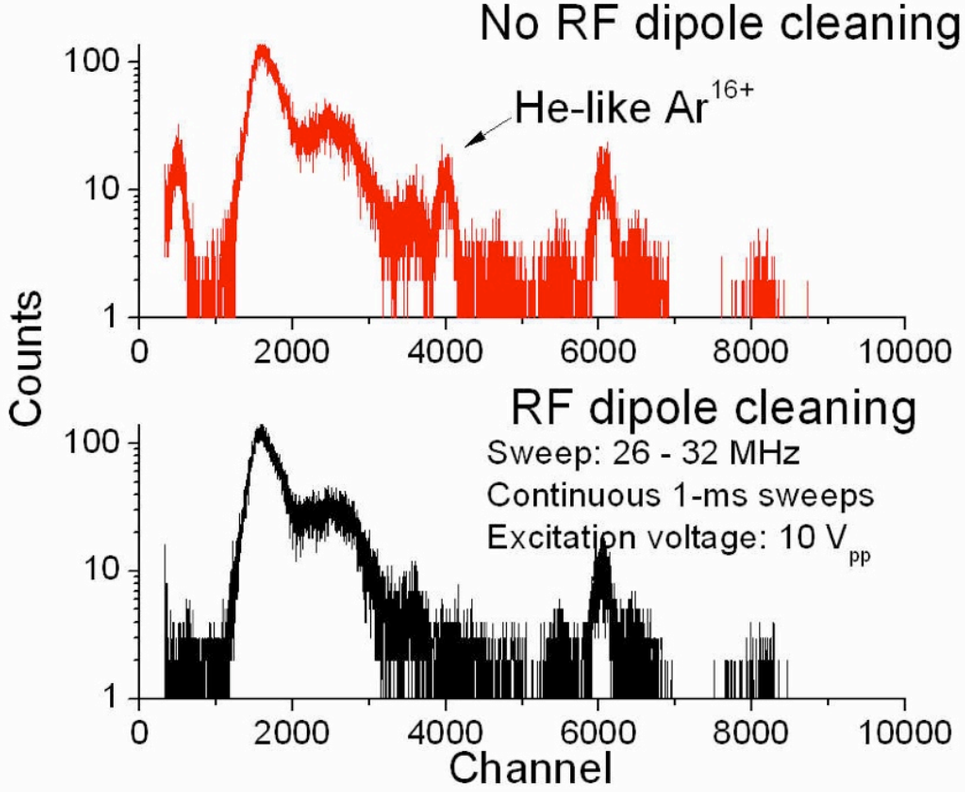
* Residual gas contamination can be removed by applying an RF dipole field on the trapping electrodes.

* Two observations methods: TOF on MCP and X-ray detection.

TOF on MCP



X-ray detection



Future: ^{14}Be

The challenges for ^{14}Be mass measurement:

* Very short lived (4.4 ms)

→ Performed measurements on ^{6}Li and ^{12}C at 100 Hz

* Very low yield (ISOLDE: Ta target: 6 ions/s, UC: 4 ions/s)

Need for short TaC target

→ Did a ^{12}Be measurement with 30 ions/s

If seen at yield station, we can take it

Thanks!

- The TITAN Group: Jens Dilling, Paul Delheij, Dave Lunney, Melvin Good, Alain Lapierre, Ryan Ringle, Thomas Brunner, Stephan Ettenauer, Aaron Gallant
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