Determination of proton radii and neutron skin thickness of p,sd shell nuclei by Charge Changing Cross Section Measurement

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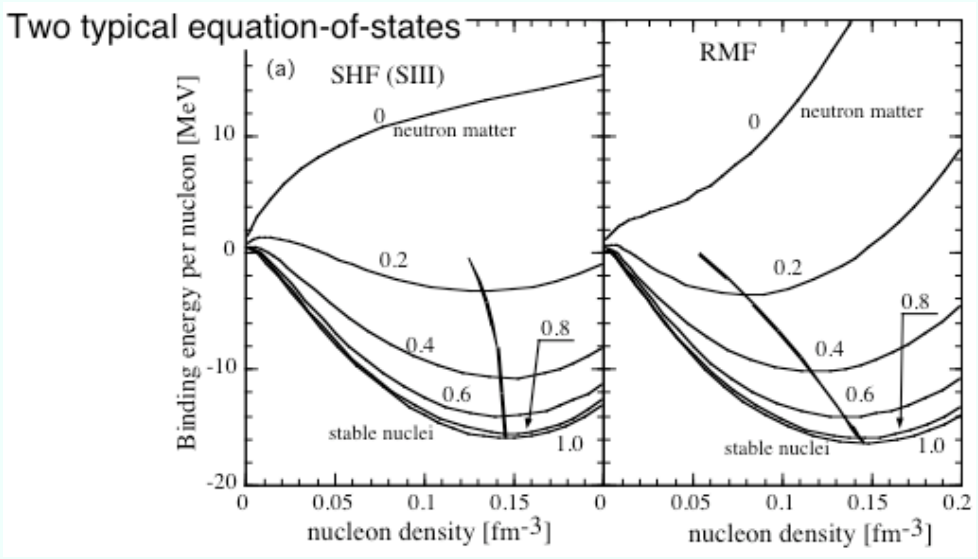
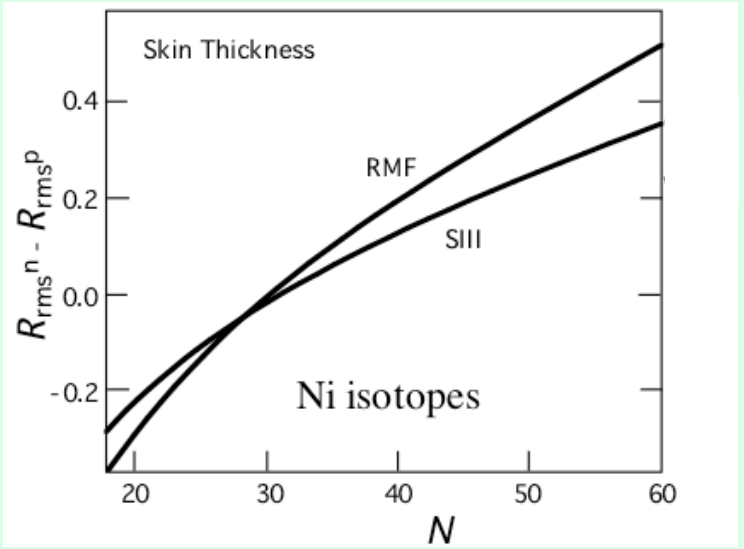
Neutron skin



K. Oyamatsu *et al*, Nucl. Phys. A 634(1998)3

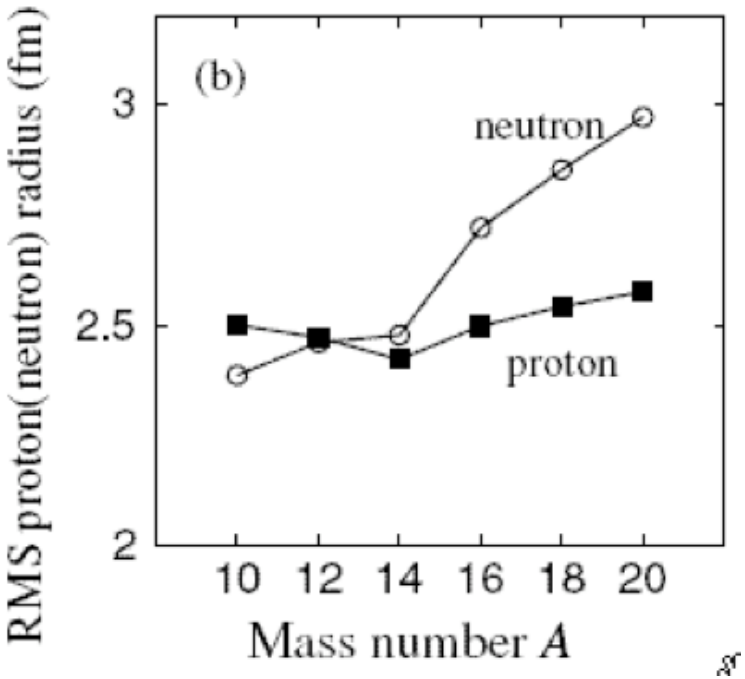


A guidance for the equation of state of asymmetric nuclear matter.

Testing nuclear structure models: *cluster structure*

AMD, FMD, ab initio models

AMD calculations for deformation in C

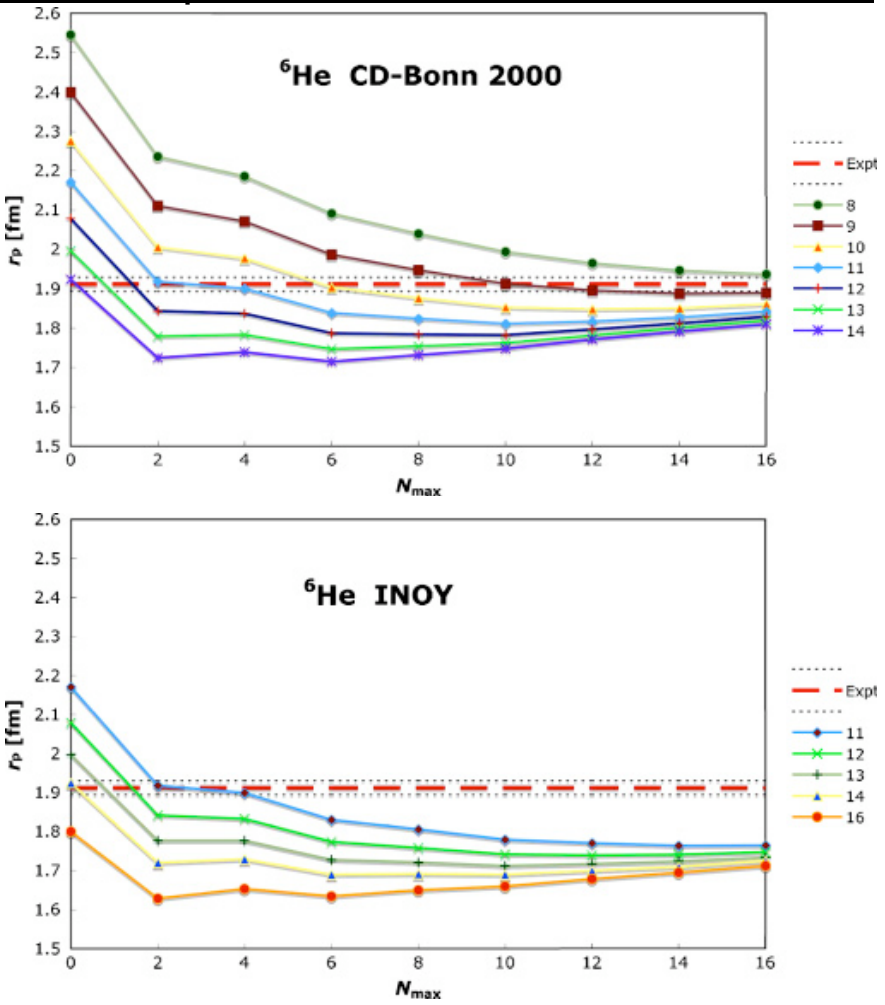


Y. Kanada-En'yo, Phys, Rev. C 71 (2005) 014310.

Charge radius constrains:

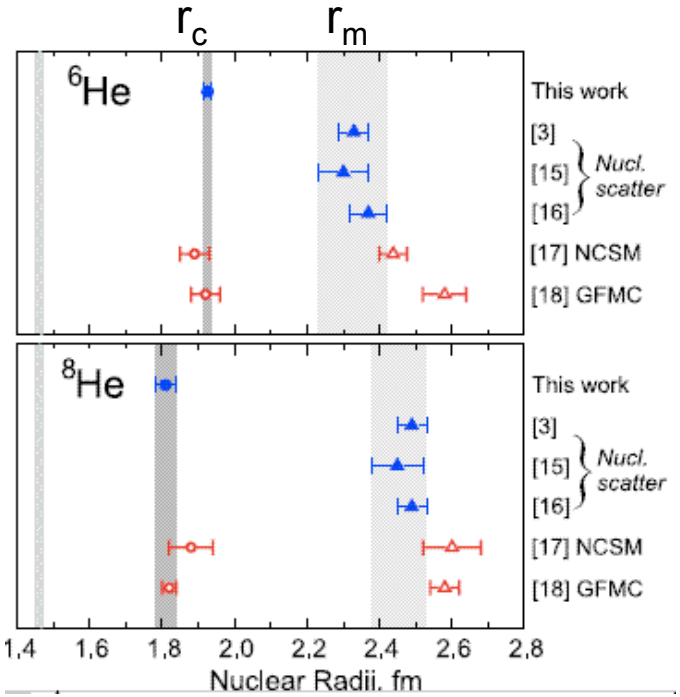
- n-n interaction
- deformation

Test NN potentials in *ab initio* calculations



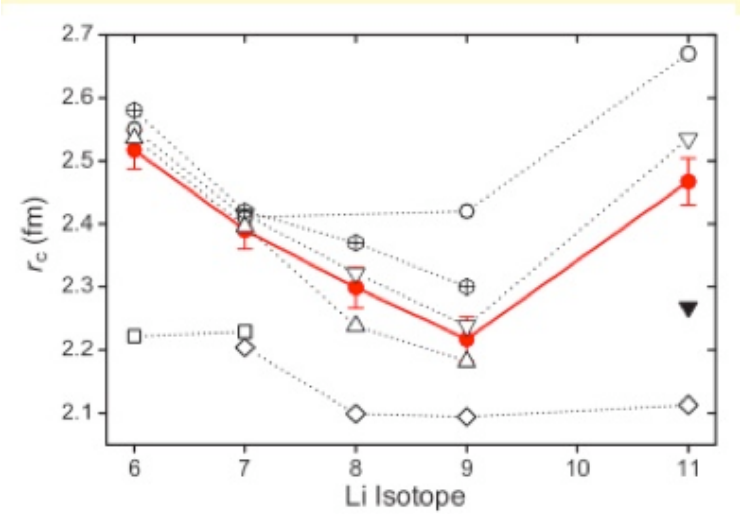
E. Caurier and P. Navratil, PRC 73 (2006) 021302

Nucleon correlation



P. Mueller et al, PRL 99(2007)252501

^{11}Li: two neutron halo, but core excitation also contributes to r_c.



R. Sanchez et al, PRL 96(2006)033002

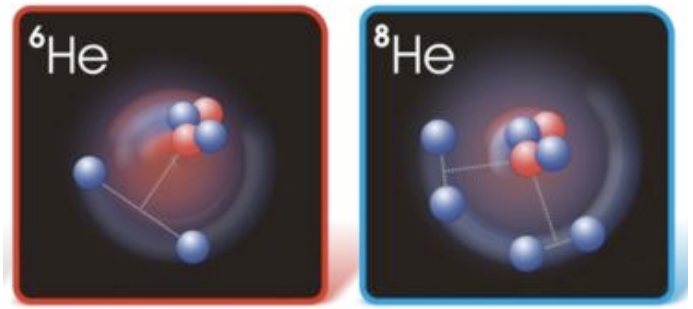


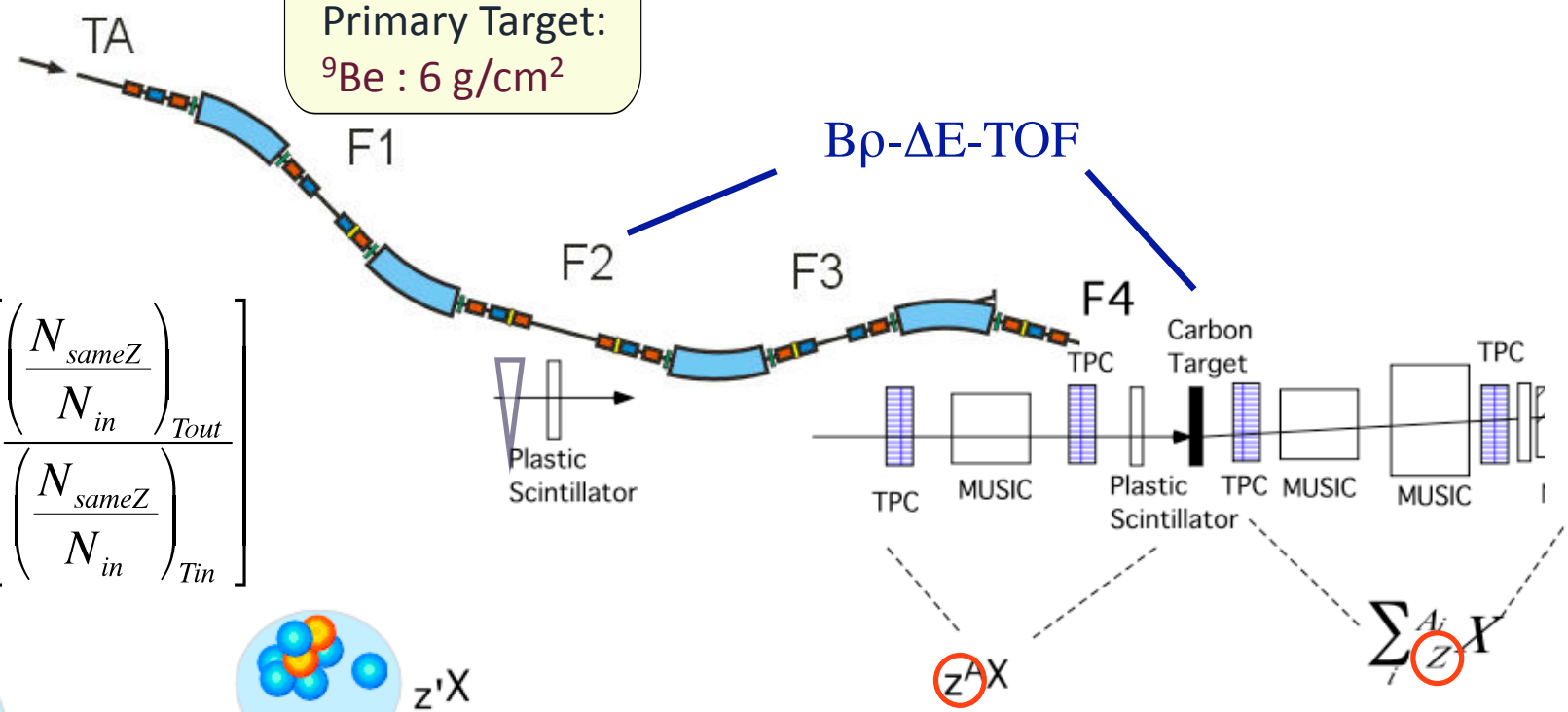
Figure courtesy : P. Mueller, ANL

^{6}He: halo neutrons are on the same side of the core.

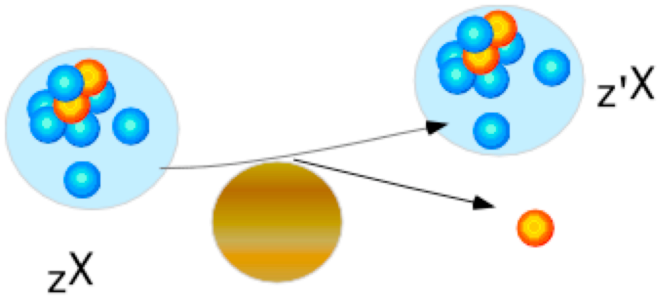
Proposed experiment

Primary Beams:
^{22}Ne, ^{48}Ca, ^{40}Ar

Primary Target:
^{9}Be : 6 g/cm^2



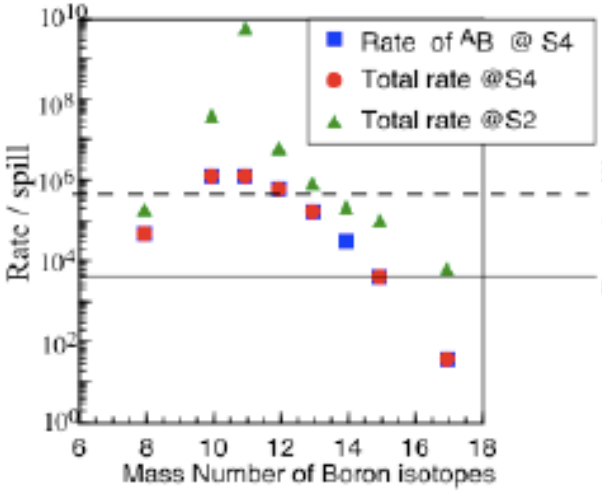
$$\sigma_{cc} = \frac{1}{t}\ln\left[\frac{\left(\frac{N_{sameZ}}{N_{in}}\right)_{Tout}}{\left(\frac{N_{sameZ}}{N_{in}}\right)_{Tin}}\right]$$



- Tracking of outgoing same Z particles.
- Efficiency of same Z detection.

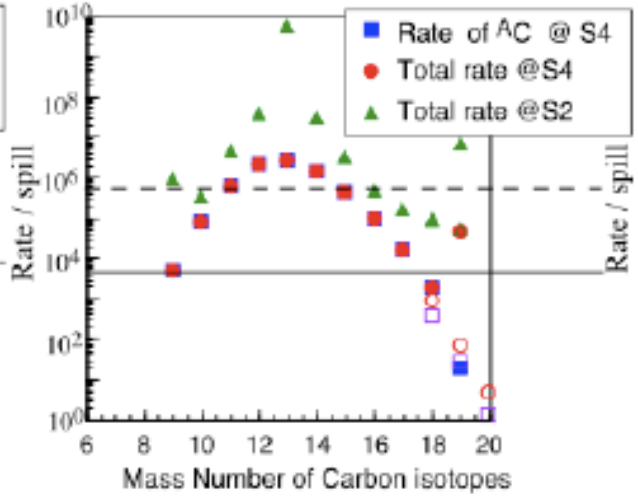
Secondary beam rates

^{22}Ne beam for $^{8\text{-}15,17}$B

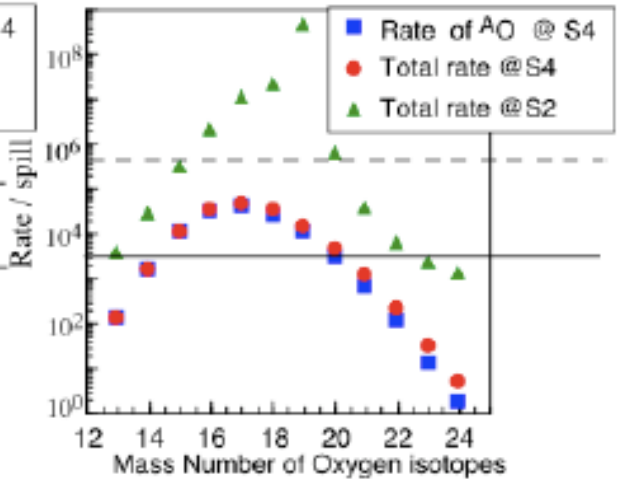


^{22}Ne beam for $^{9\text{-}17}$C

^{40}Ar beam for $^{18\text{-}20}$C



^{48}Ca beam for $^{13\text{-}24}$O



Goal: **1.e+5** events/isotope for **1.5 %** accuracy

Rate limits:

- 1.e+5 at S2
- 3.e+3 at S4 (to minimize dead time)

Beam requested

Approved beamtime: 24 shifts *(Category A)*

Primary beams required: ^{22}Ne, ^{48}Ca, ^{40}Ar

Energy: 1*A* GeV

Isotopes to be studied: B, C, O isotopic chains

Experiment location: FRS (F4)

Preferred running time: April - May 2011