

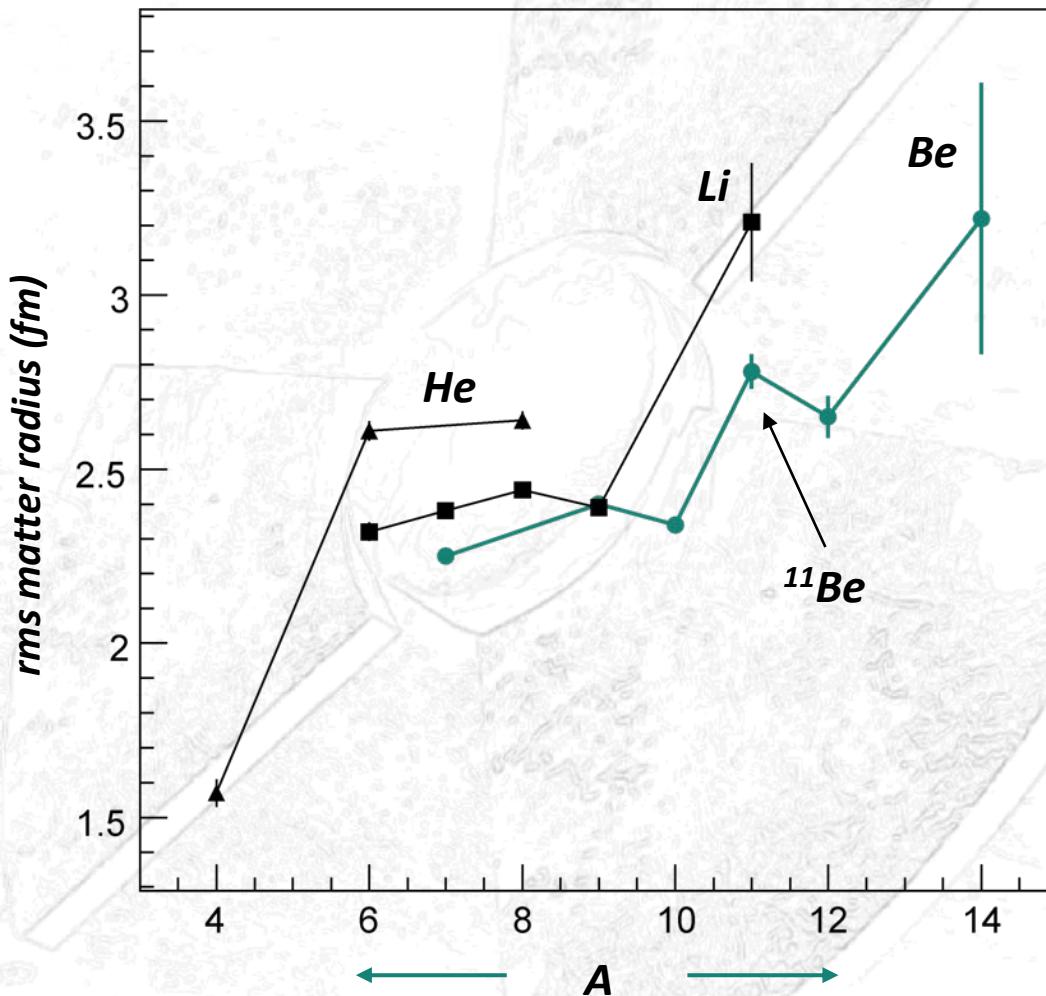


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The Many Faces of Laser Spectroscopy at ISOLDE: Probing the Nuclear Structure of Exotic Be, Mg, Cu and Ga Isotopes



Halo nuclei

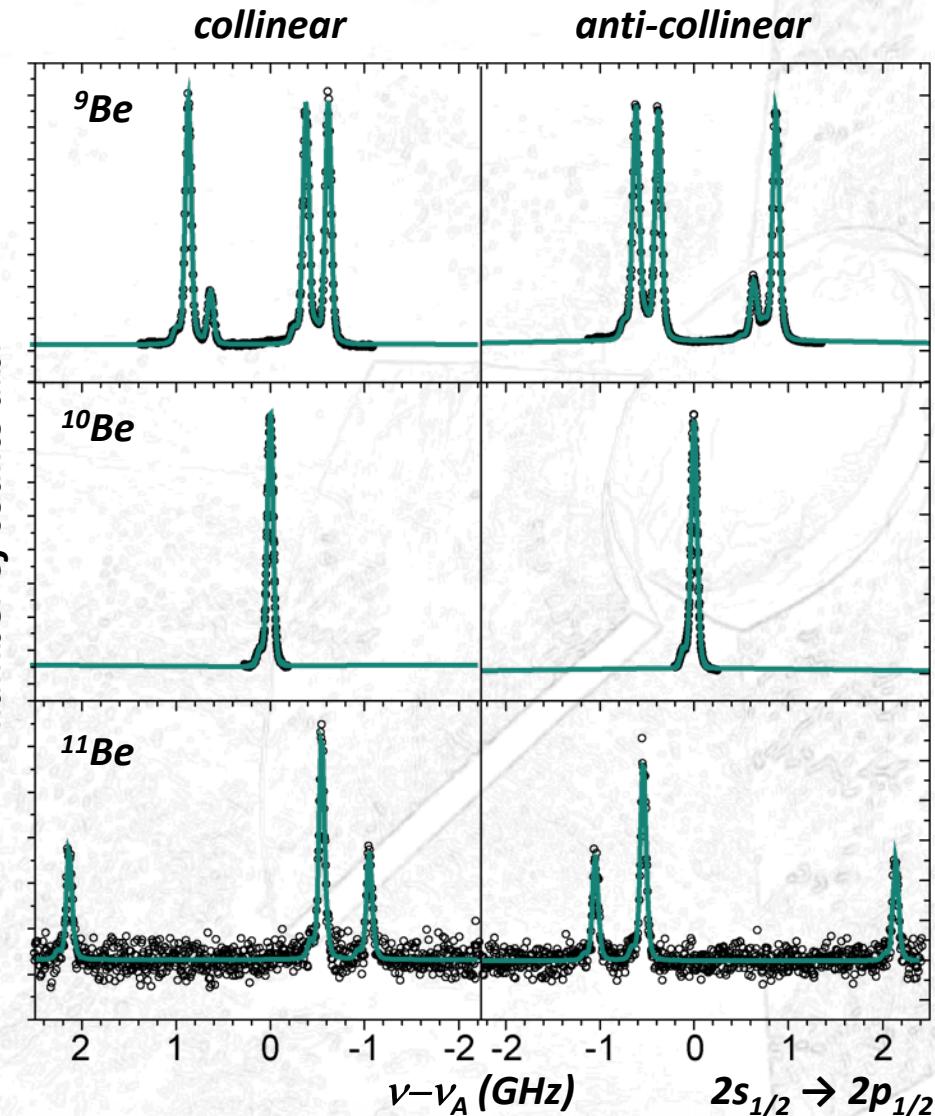


Matter radii from interaction cross sections

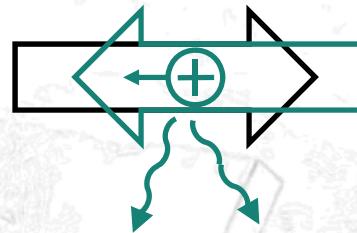
I. Tanihata *et al.*, Phys. Lett. B 206, 592 (1988)



First use of a frequency comb at ISOLDE



Collinear anti-collinear spectroscopy
with a frequency comb for absolute
frequency determination
of $^{7,9,10,11}\text{Be}^+$



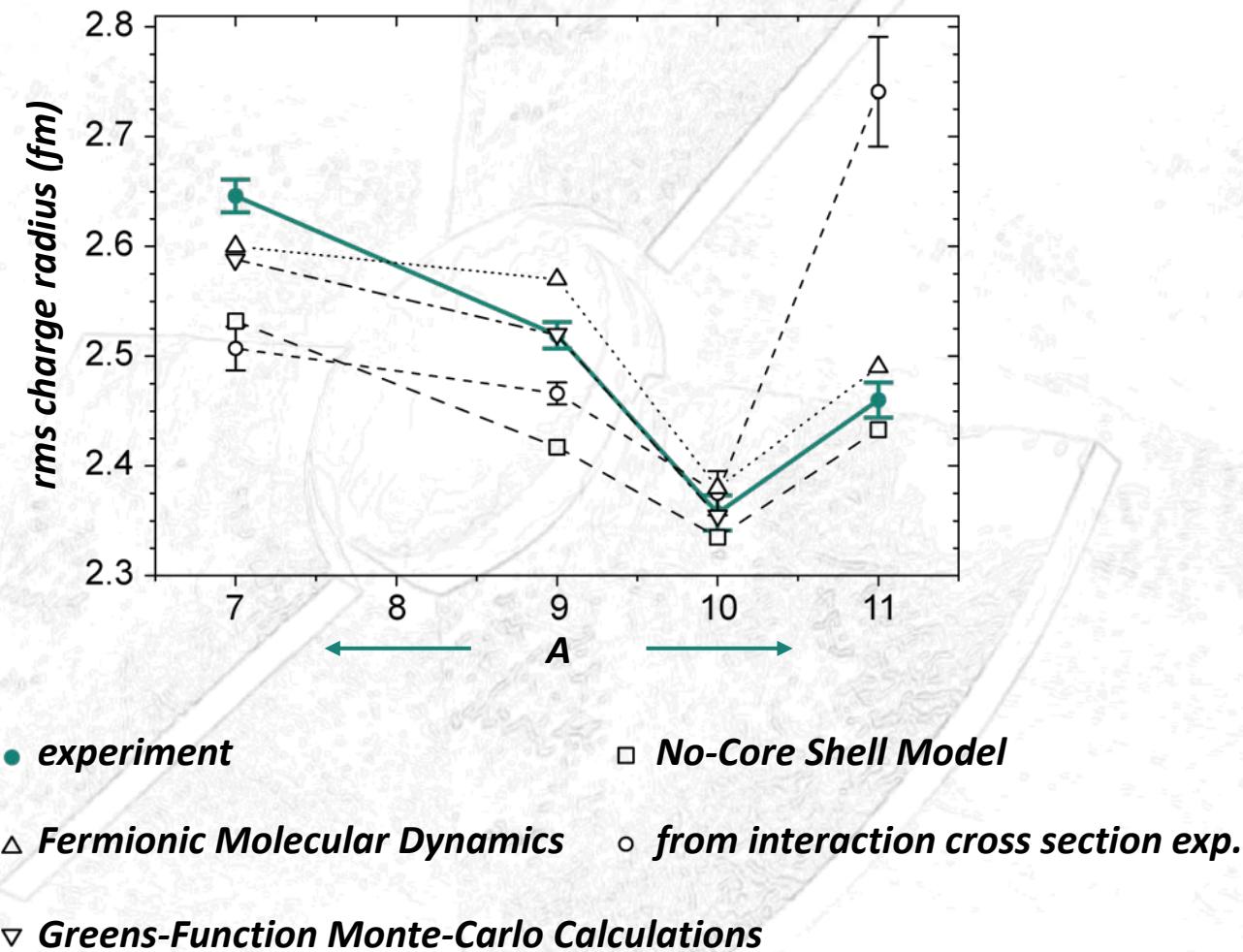
Presentation by Christopher Geppert

| Isotope | Yield | Meas. time |
|------------------|--|------------|
| ^{11}Be | $5.7 \text{ f}i 10^7 \text{ ions/pulse}$ | 2 hours |

W. Nörterhäuser *et al.*, Phys. Rev. Lett., accepted



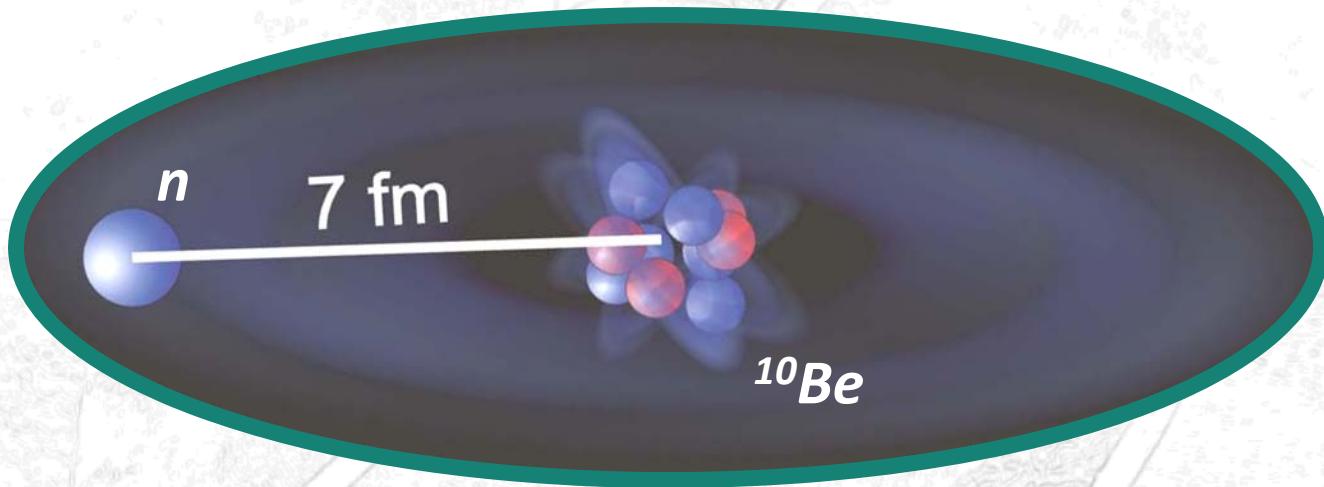
Experiment versus Theory



W. Nörterhäuser *et al.*, Phys. Rev. Lett., accepted



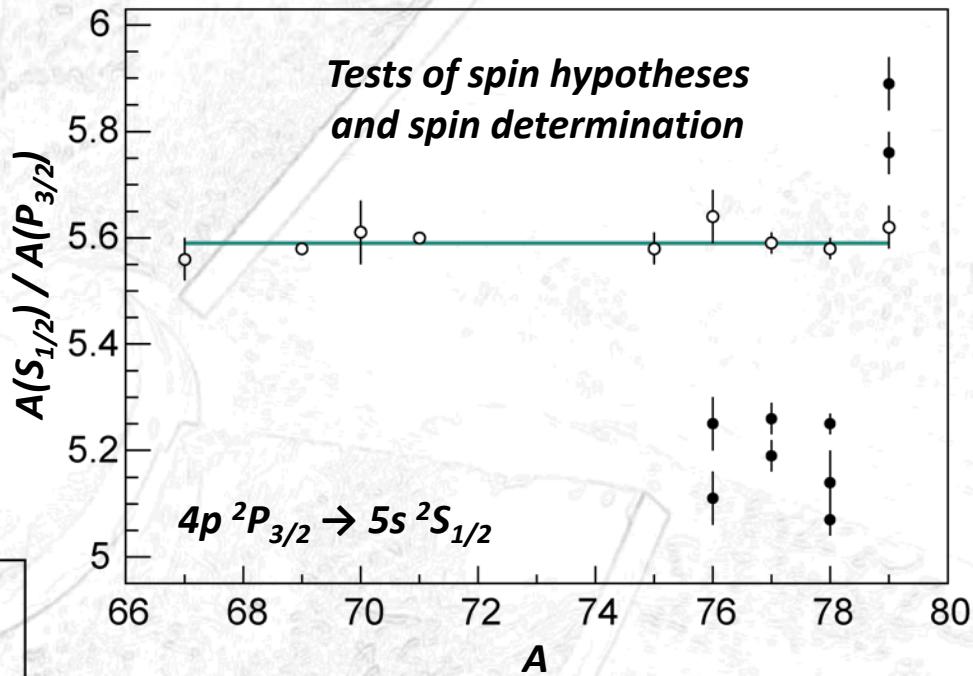
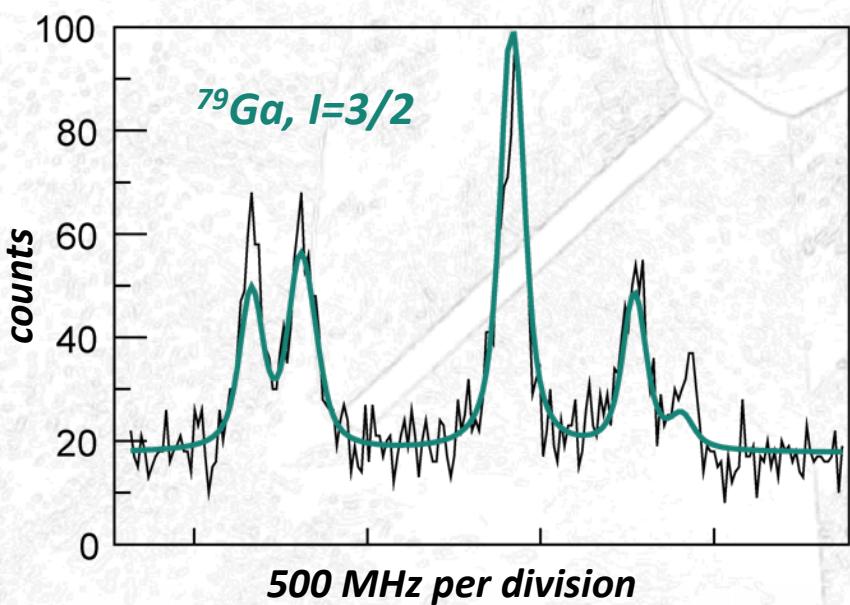
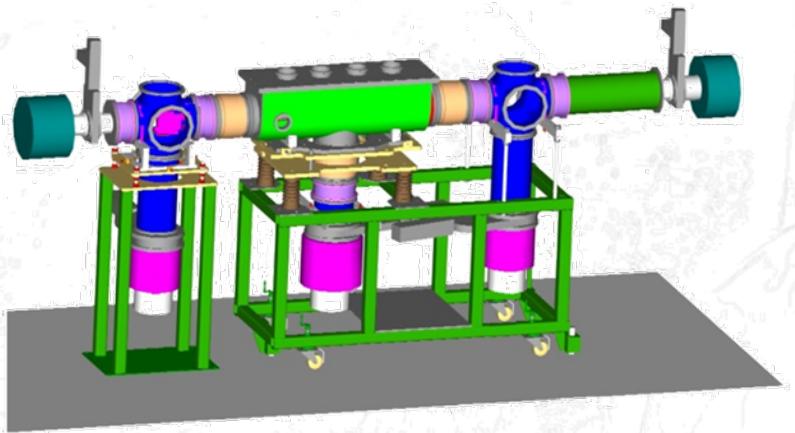
The simplified Halo picture of ^{11}Be



W. Nörtershäuser *et al.*, Phys. Rev. Lett., accepted



First use of a RFQ for laser spectroscopy at ISOLDE

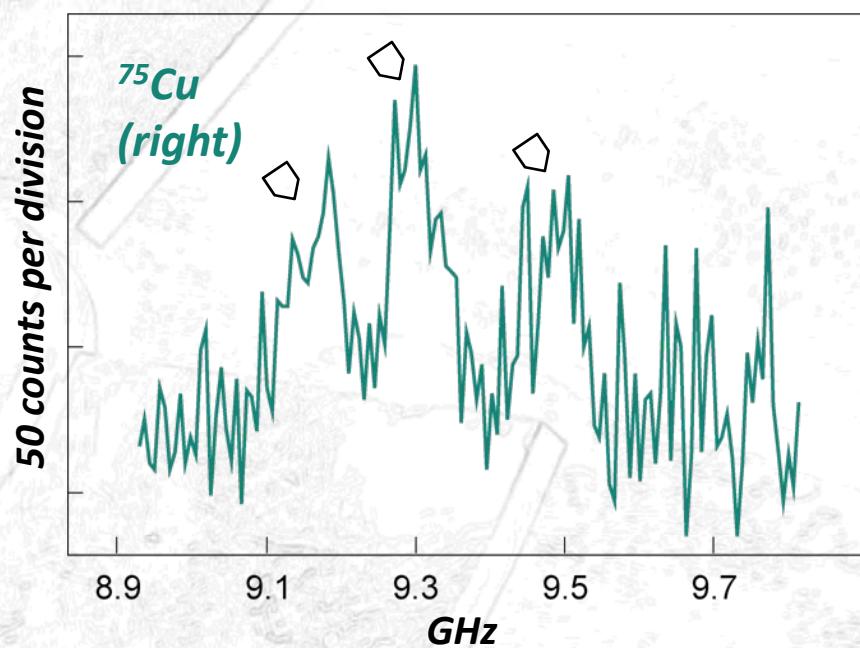
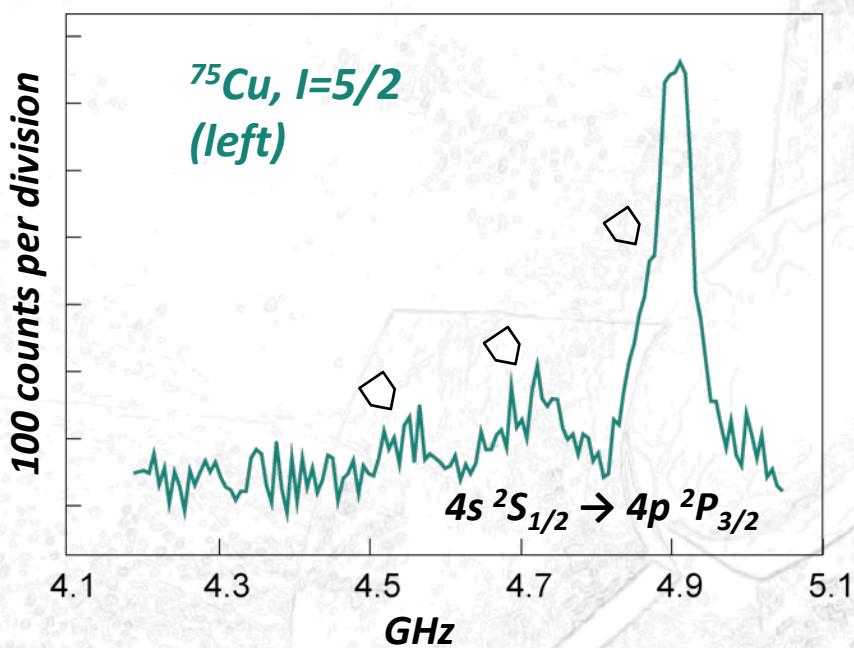


| Isotope | Yield | Meas. time |
|--------------------|---------------------------|------------|
| ${}^{79}\text{Ga}$ | $\approx 10^8$ ions/pulse | 40 min |

presentation by Ernesto Mané



Spectroscopy of exotic copper isotopes

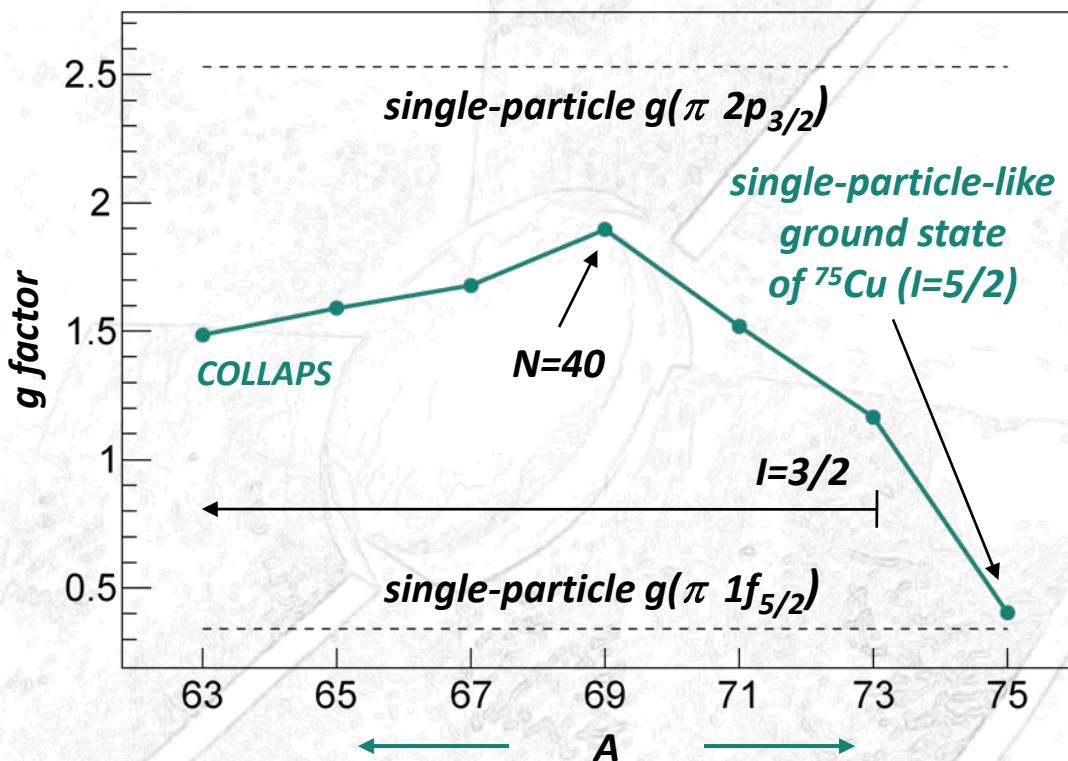


| <i>Yield</i> | <i>Meas. time</i> |
|----------------------------|-------------------|
| 2×10^5 ions/pulse | 7 hours |

P. Vingerhoets, PhD in progress
K. Flanagan, P. Vingerhoets, publications in preparation



High-resolution g-factors of the odd-A cases



Theory:

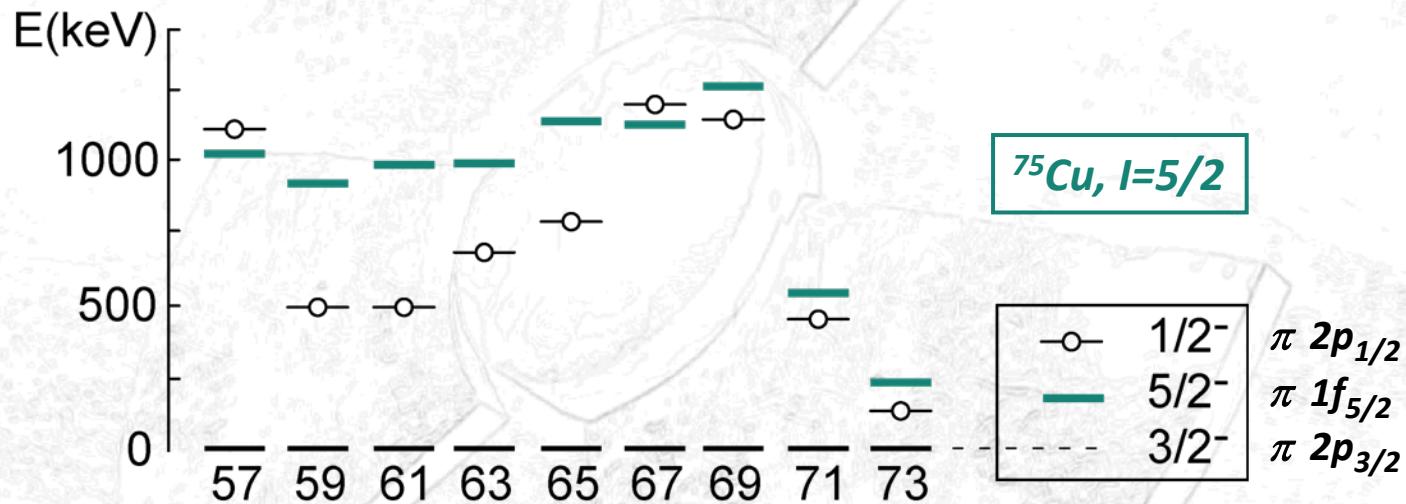
- reproduces the trend between 59 - ^{69}Cu ;
- does not describe the drop towards ^{75}Cu ;
- does not match with the value of ^{57}Cu ;

P. Vingerhoets, PhD in progress

K. Flanagan, P. Vingerhoets, publications in preparation



Monopole migration of the $\pi 1f_{5/2}$ orbital; Inversion at ^{75}Cu

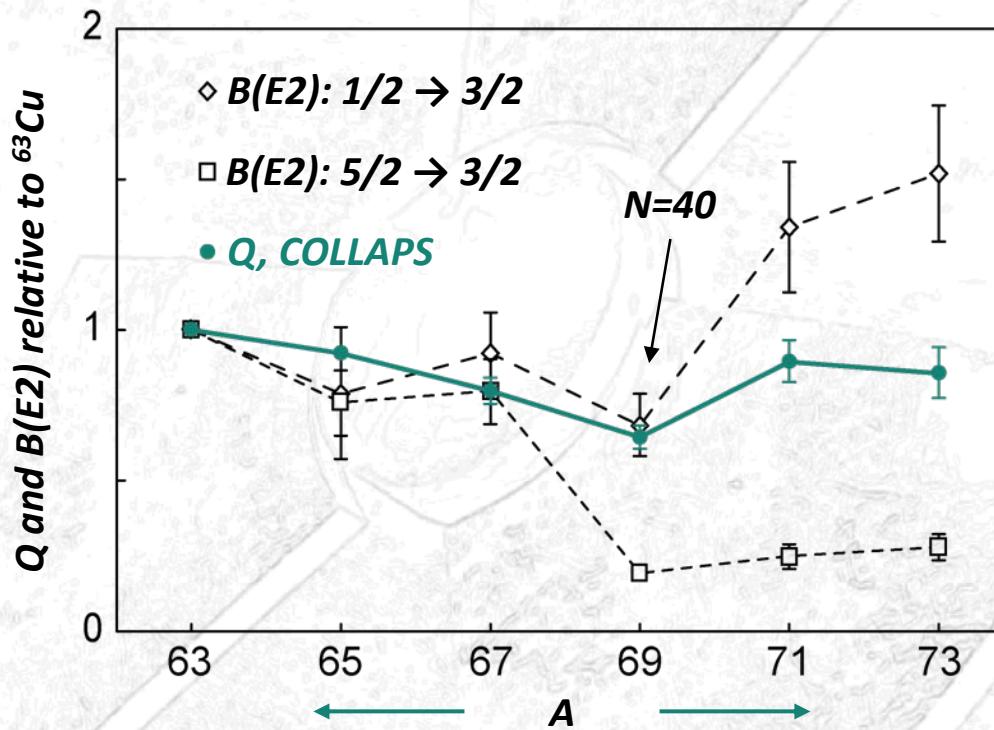


S. Franschoo *et al.*, Phys. Rev. C **64**, 054308 (2001).

I. Stefanescu *et al.*, Phys. Rev. Lett. **100**, 112502 (2008).



Quadrupole moments of the odd- A cases Comparison to $B(E2)$ values

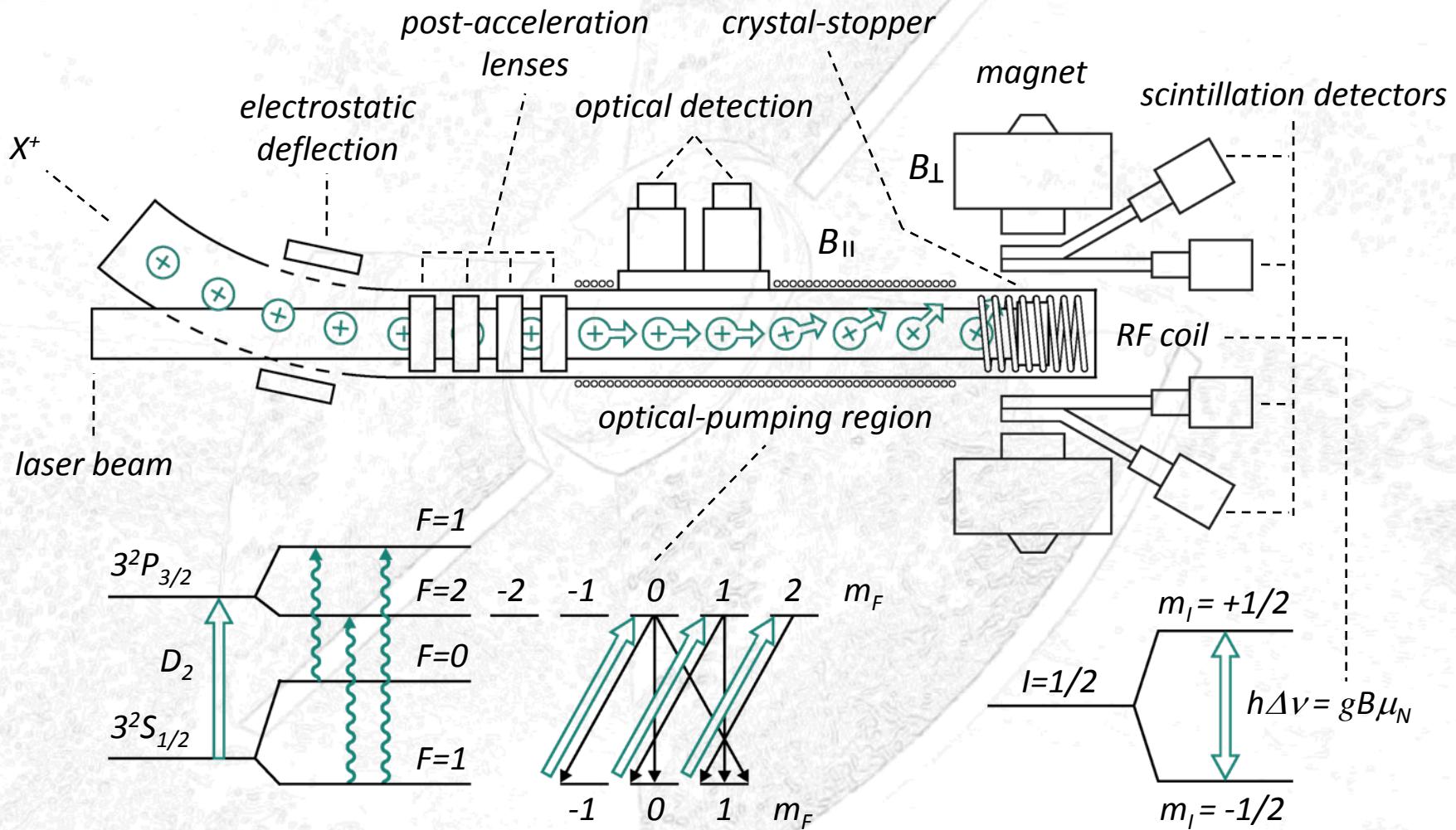


$B(E2)$ from: I. Stefanescu *et al.*, Phys. Rev. Lett. **100**, 112502 (2008).

- **minimum at $N=40$ for all;**
- **no evidence for big changes in the collectivity of the ground state from the Q moments;**



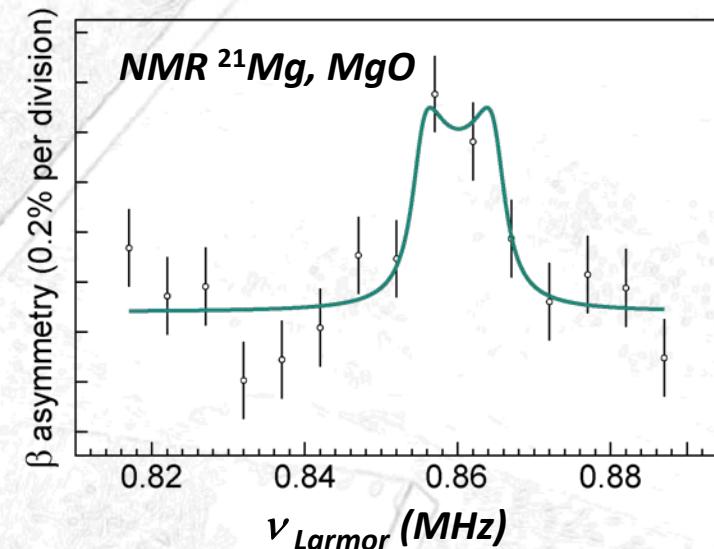
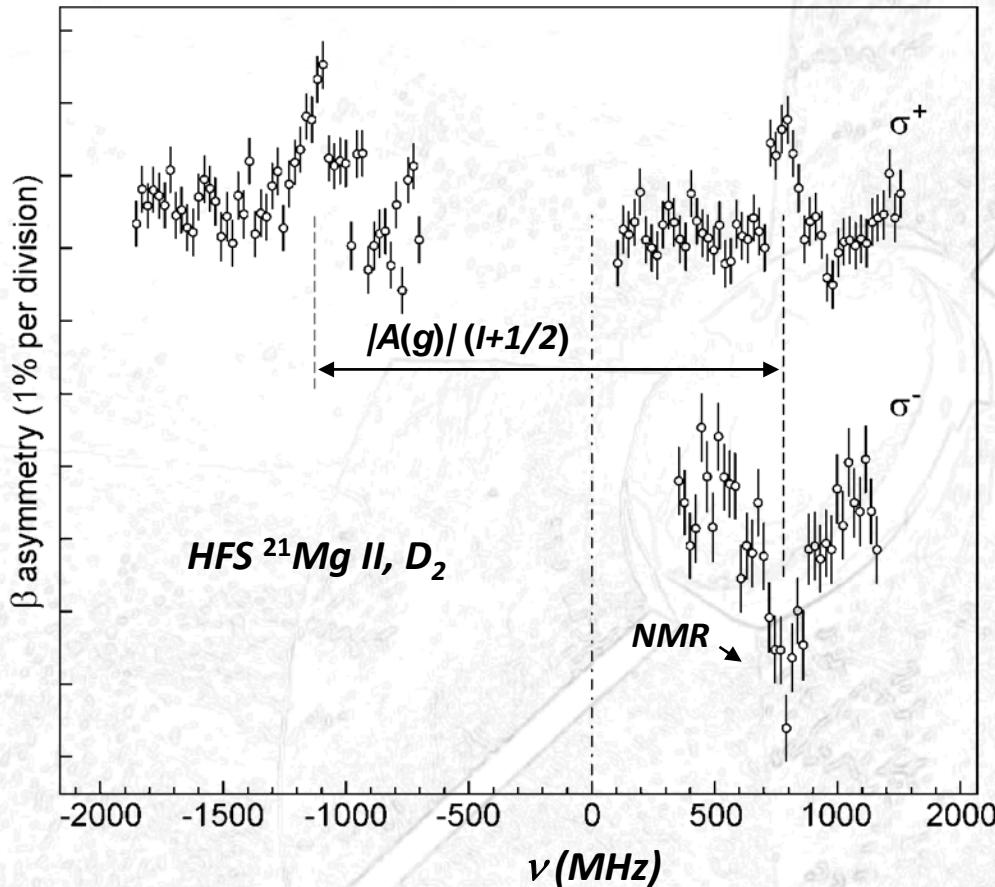
The β -NMR technique





preliminary

Spin and magnetic moment ^{21}Mg



| Yield | Meas. time |
|------------------------------|------------|
| 1.6×10^4 ions/pulse | 8 hours |

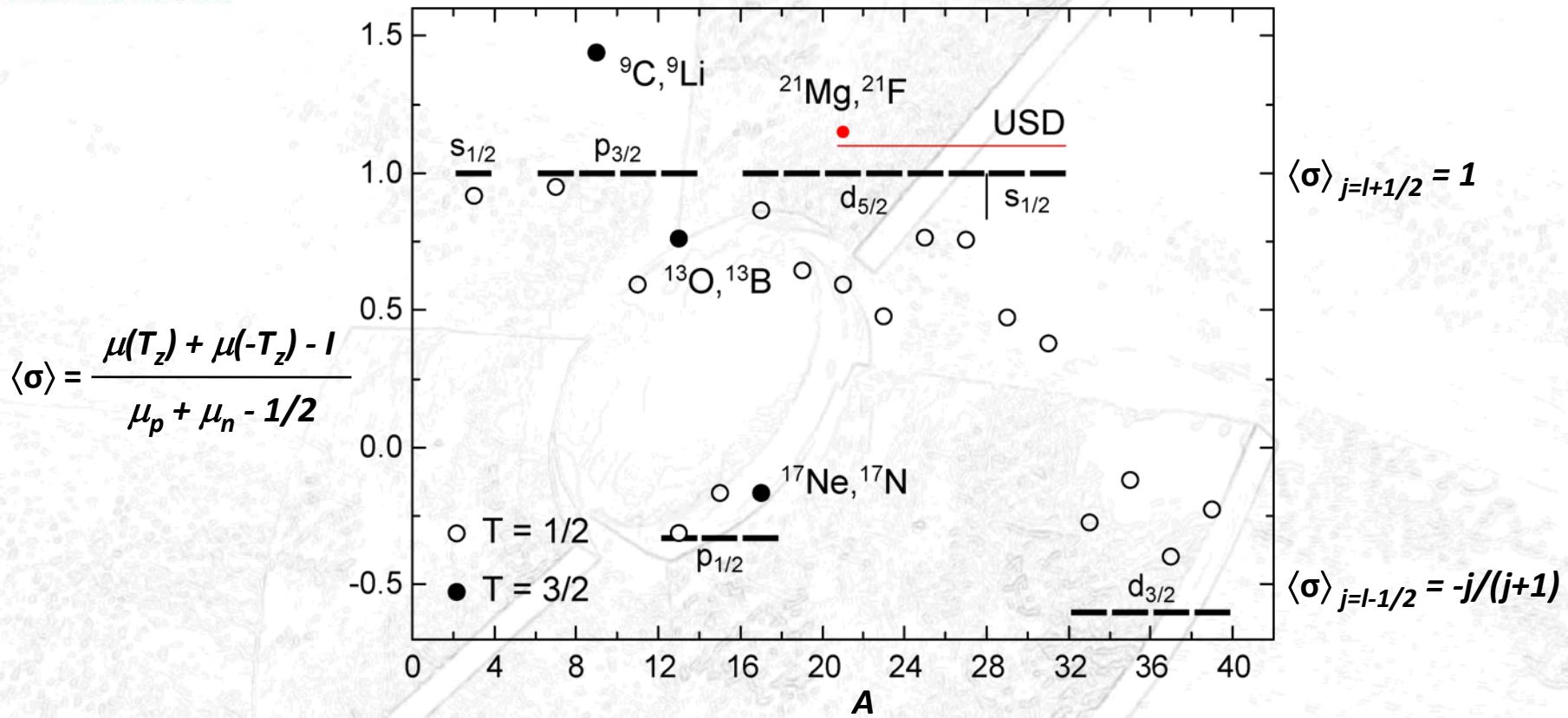
| Ground-state properties of ^{21}Mg | |
|---|-----------|
| $\mu = -0.983(7)\mu_N$ | $I = 5/2$ |

- the mirror partner ^{21}F ($T=3/2$) has a known magnetic moment;
 - extracted the isoscalar and isovector parts of the magnetic moment;
- J. Krämer, PhD and paper in progress.



preliminary

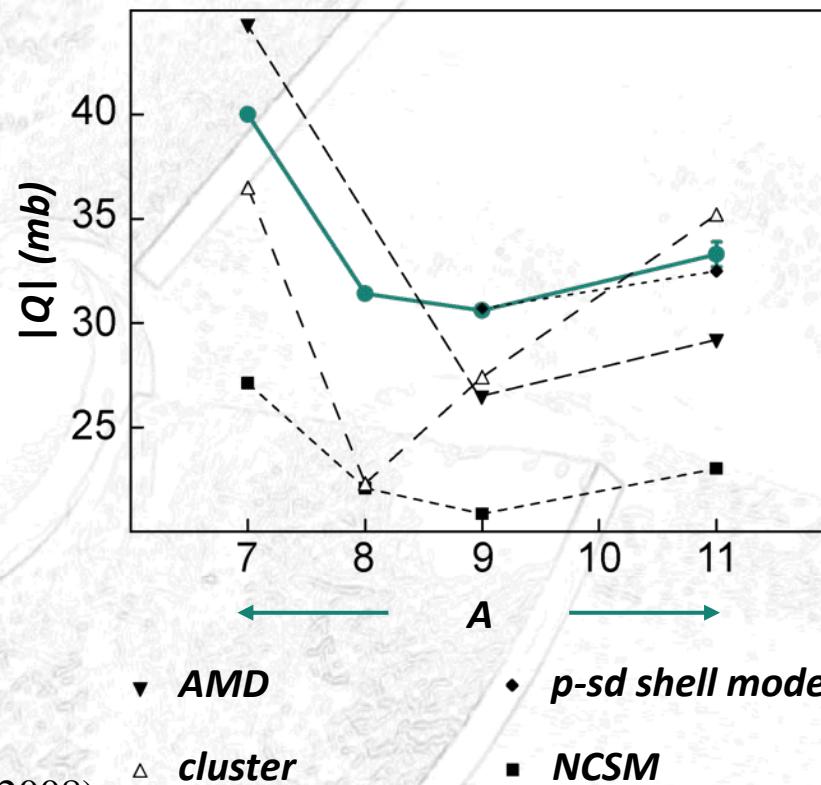
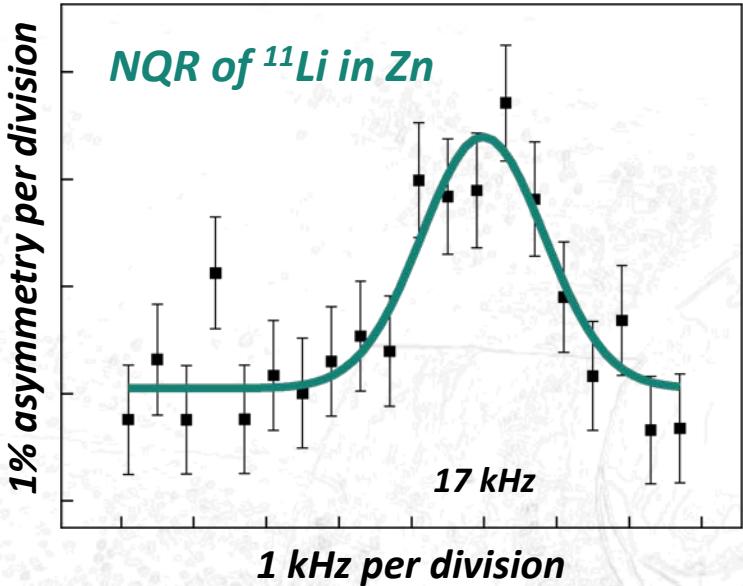
Spin expectation value for A=21



- $\mu(^{21}\text{Mg}) + \mu(^{21}\text{F}) > \mu_{\nu d5/2} + \mu_{\pi d5/2}$, contrary to the systematics, $\langle \sigma \rangle = 1.15(2)$;
 - higher value than the shell-model prediction \rightarrow isospin nonconservation;
 - to understand of the isovector moment in light of the decay properties;
- J. Krämer, PhD and paper in progress.



Quadrupole moment of the two-neutron halo ^{11}Li



$$^9\text{Li} - ^{11}\text{Li}: |\Delta Q / Q| = 8.8(15)\%$$

R. Neugart *et al.*, Phys. Rev. Lett. **101**, 132502 (2008).

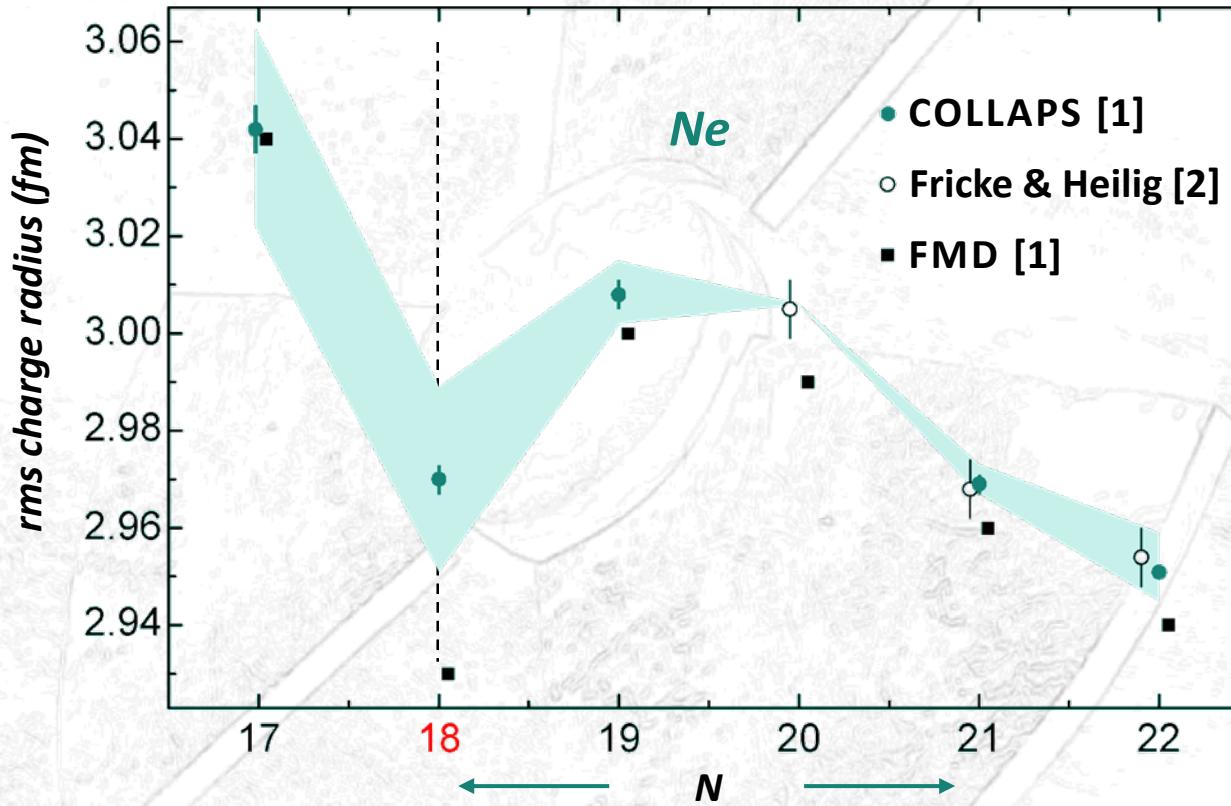
$$^9\text{Li} - ^{11}\text{Li}: \Delta \langle r^2 \rangle^{1/2} / \langle r^2 \rangle^{1/2} = 11(2)\%$$

R. Sánchez *et al.*, Phys. Rev. Lett. **96**, 033002 (2006).

| Yield | Meas. time |
|----------------|------------|
| 500 ions/pulse | 8 hours |



Cluster correlations in Ne isotopes

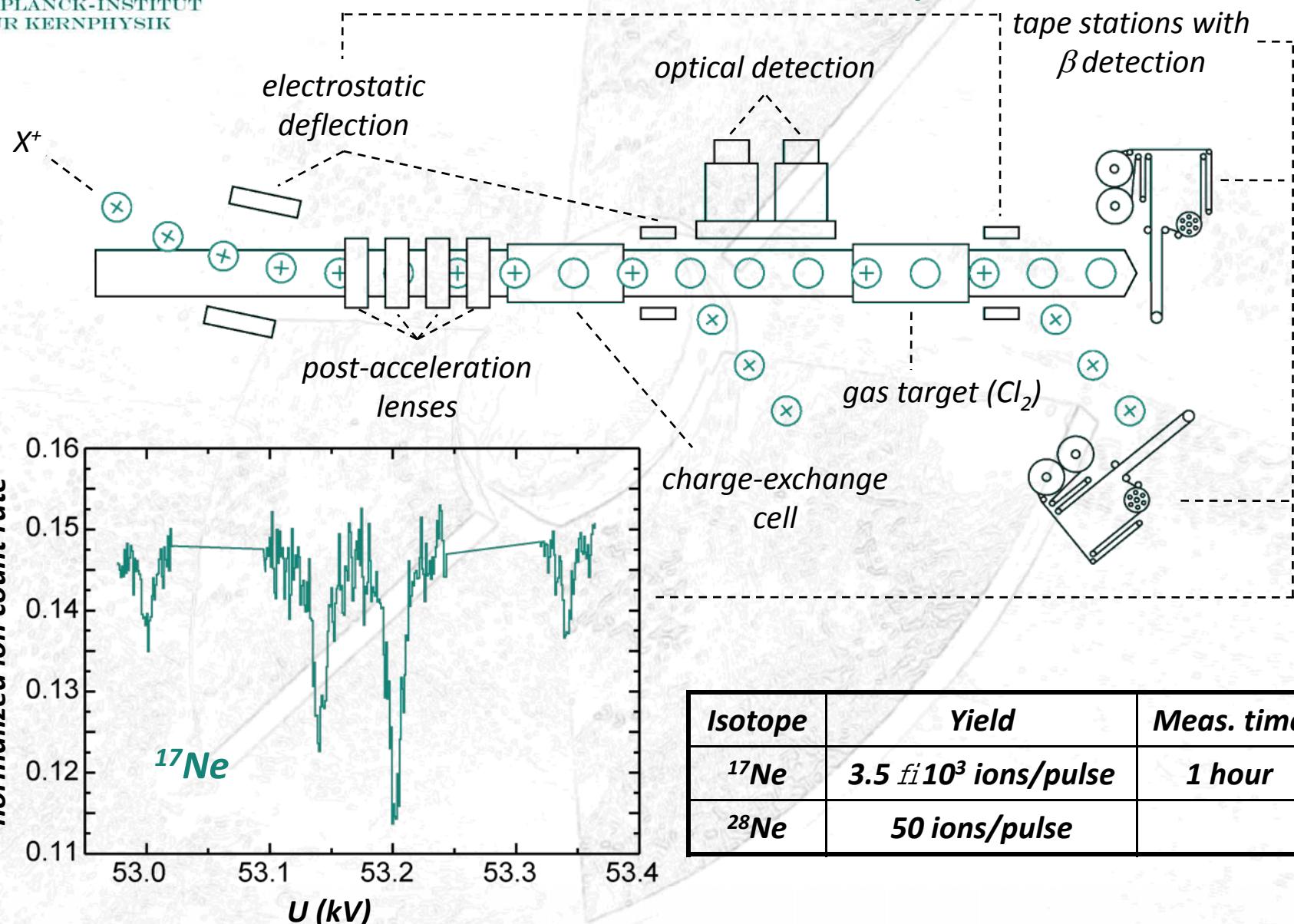


[1] W. Geithner *et al.*, Phys. Rev. Lett. (2008), submitted.

[2] G. Fricke and K. Heilig, *Nuclear Charge Radii*, vol. I / 20 (Springer, 2004), ISBN 3-540-42829-1.



The collisional-ionization technique





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With respect to the authors of the work on Li and Ne!!!

