Shell evolution along Ar isotopic chain.

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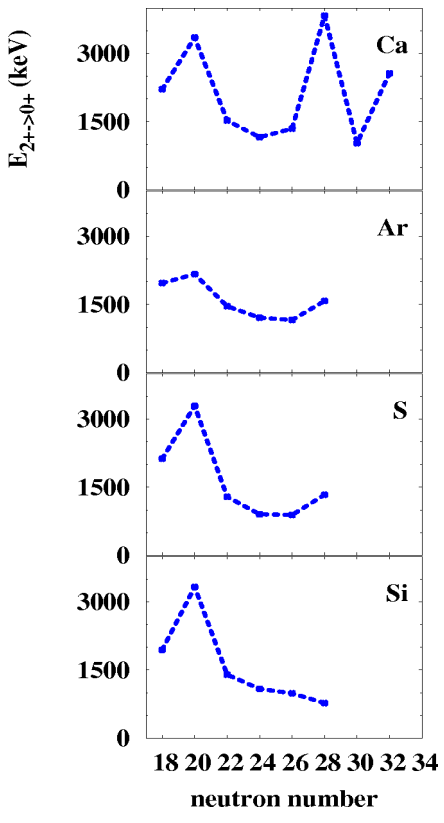
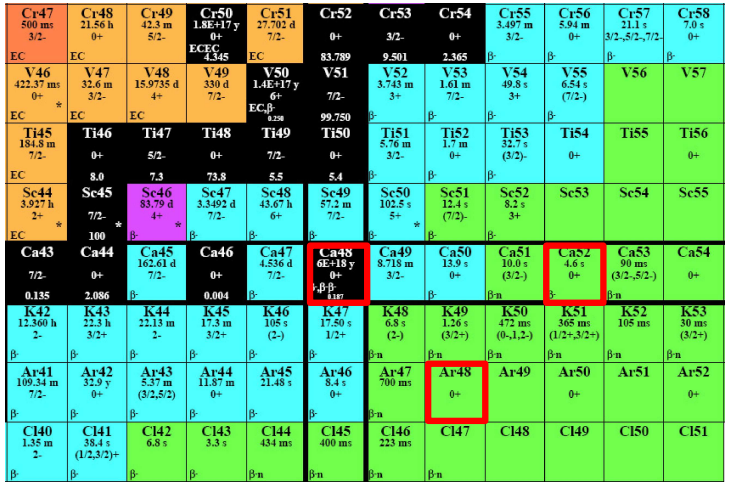
Outline

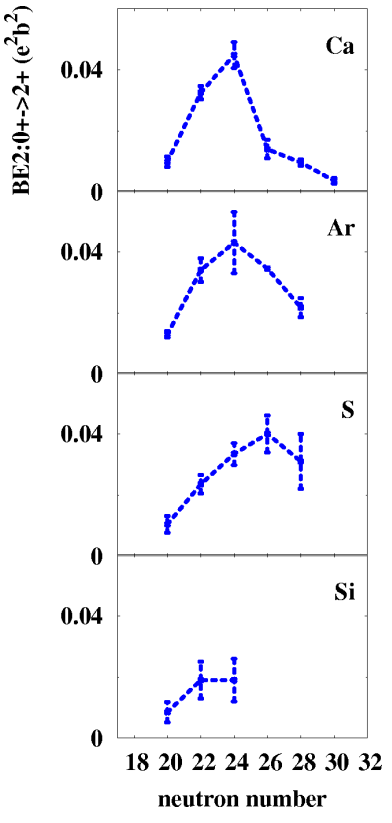
Systematic



- Shell evolution
- Magic number migration

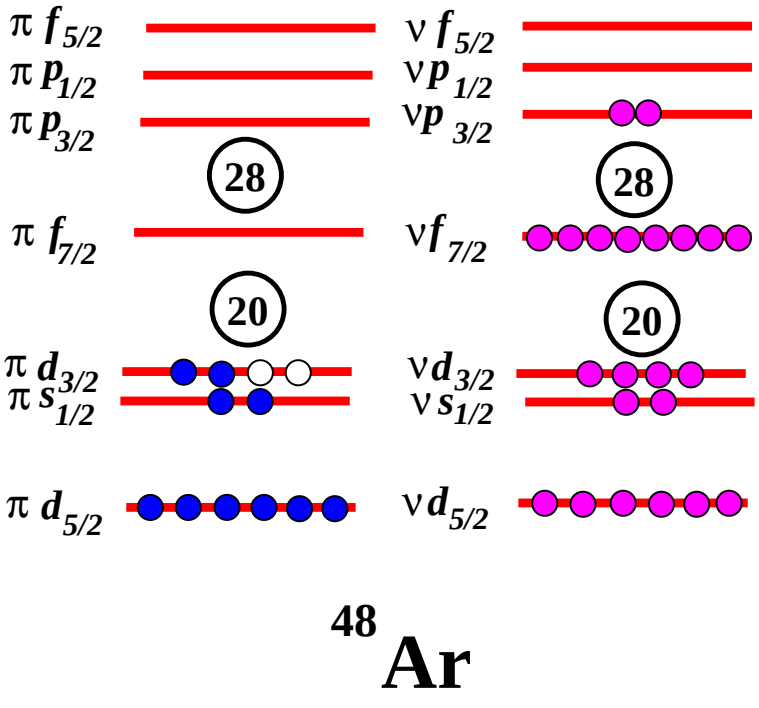


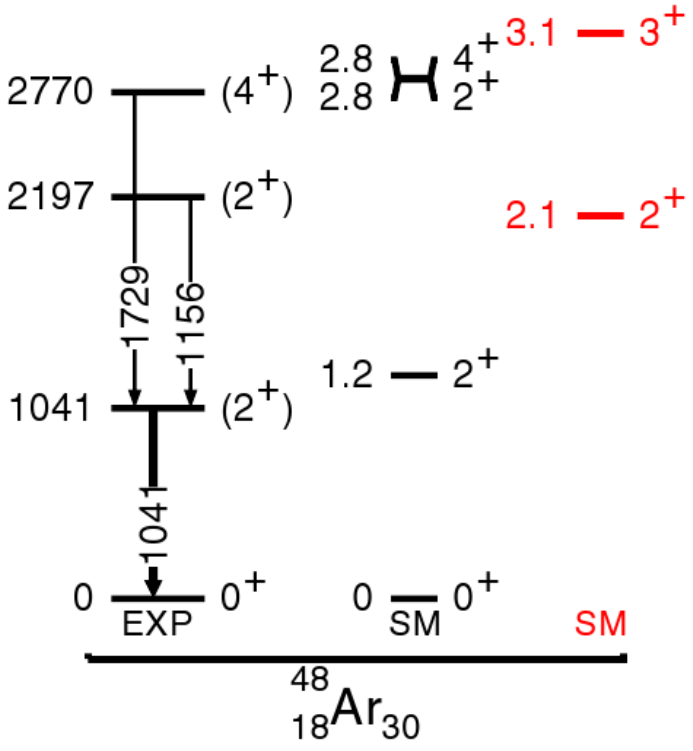
- Shape change



N=28 isotopes: ^{48}Ar

spectroscopic information





- Inverse kinematics (GANIL) and fragmentation (MSU) reaction.
- Triaxial structure.

A. Gade *et al.*, Phys.Rev.Lett.**102**, 182502 (2009), S. Bhattacharyya, Phys.Rev.Lett **101**, 032501 (2008)

Experiment details

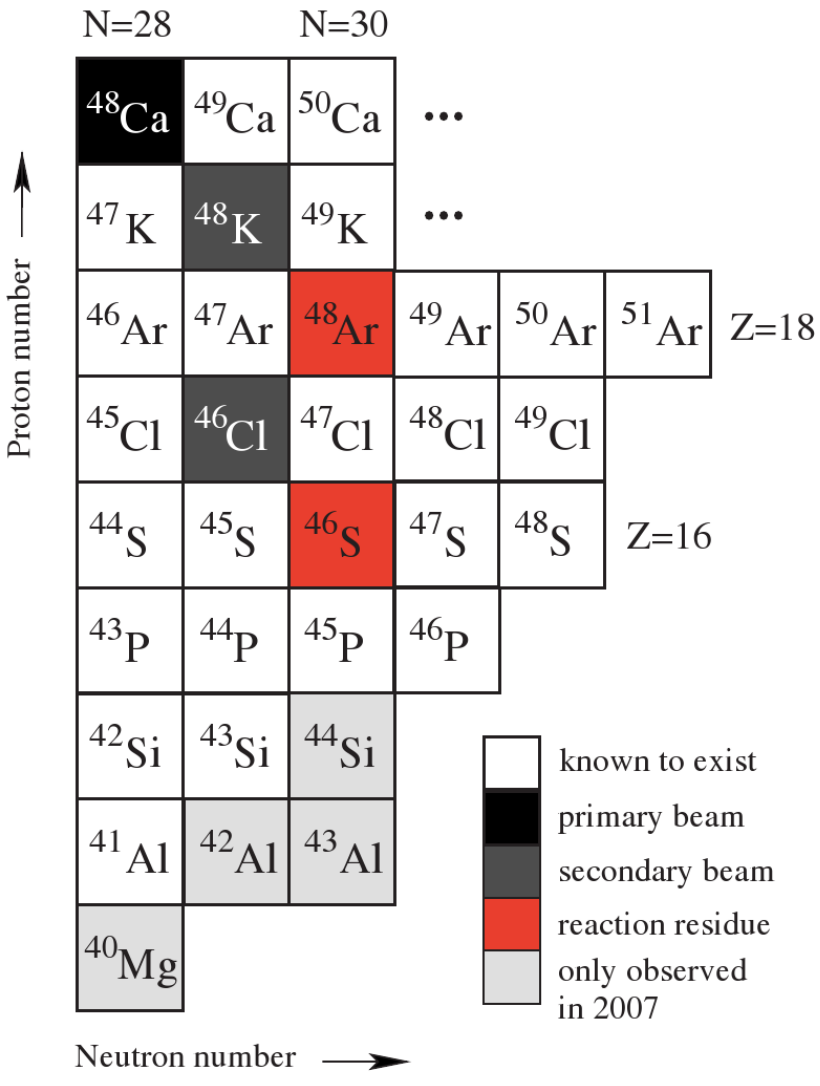
Cross section (b) using EPAX calculations

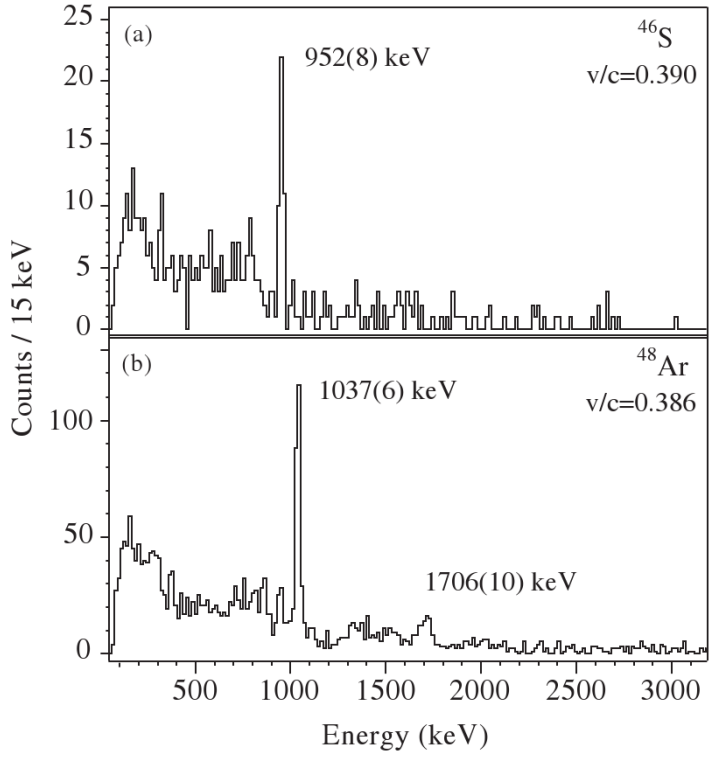
	^{48,49}Ar
^{64}Ni,**10^{10}p/s**	2E-8,2E-9
^{76}Ge,10^{9}p/s	1E-8,1E-9
^{82}Se,10^{9}p/s	1E-8,2E-9
^{86}Kr,**10^{10}p/s**	4E-9,4E-10

S4 rate: 50 p/s (4E6 p/day)

- Cross section 10^{-7} b
- 10^{10}p/s primary beam
- 1.5 g/cm^2 primary target
- 30% FRS transmission,focus on the fragment

Charge-exchange neutron-pick-up reaction





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In-Beam γ-Ray Spectroscopy of Very Neutron-Rich Nuclei: Excited States in ^{46}S and ^{48}Ar

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We report on the first in-beam γ-ray spectroscopy study of the very neutron-rich nucleus ^{46}S. The $N = 30$ isotones ^{46}S and ^{48}Ar were produced in a novel way in two steps that both necessarily involve nucleon exchange and neutron pickup reactions ^{9}Be(^{48}Ca, ^{48}K)X followed by ^{9}Be(^{48}K, ^{48}Ar + γ)X at 85.7 MeV/u midtarget energy and ^{9}Be(^{48}Ca, ^{46}Cl)X followed by ^{9}Be(^{46}Cl, ^{46}S + γ)X at 87.0 MeV/u midtarget energy, respectively. The results are compared to large-scale shell-model calculations in the *sd-pf* shell using the SDPF-NR effective interaction and Z-dependent modifications.

Secondary reaction

Beam

10^{10}p/s of ^{64}Ni, unless ^{82}Se more intense beam is developed

Possible reactions

	target	E	Cross section
Knock-out	^{9}Be/H_2	100 MeVu	$\approx$ mb
Fragm.(*)	^{9}Be	100 MeVu	100 μb
Coulex	^{208}Pb/^{197}Au	100 MeVu	50 mb

*

A. Gade *et al.*, Phys.Rev.Lett.**102**, 182502 (2009), G. A. Souliotis *et al.*, Phys. Rev. C 46, 1383 (1992). R. Pfaff *et al.*, Phys. Rev. C 51, 1348 (1995).

Rate calculations

Coulex: 5E-6 Hz γ/p

- 50 mb
- 1 p/s
- 500 mg/cm2 197Au
- ε_γ 20%

Fragm:1E-3 Hz γ/p

- 100 μb
- 100 p/s
- 1 g/cm2, 9Be
- ε_γ 20%

^{48,49}Ar

Knock-out:1E-2 Hz γ/p

- 1 mb
- 10^2-10^3 p/s
- 1 g/cm2, 9Be
- ε_γ 20%

^{48}Ar