

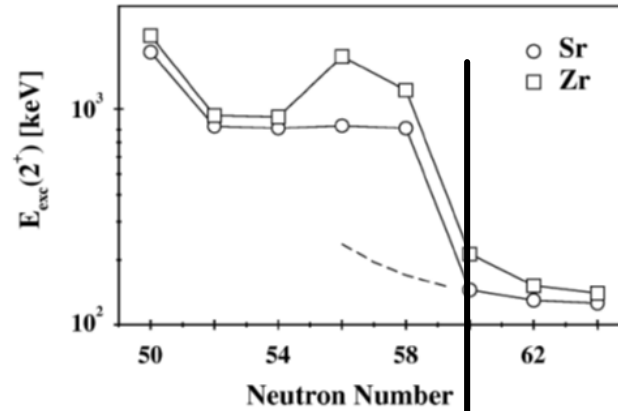
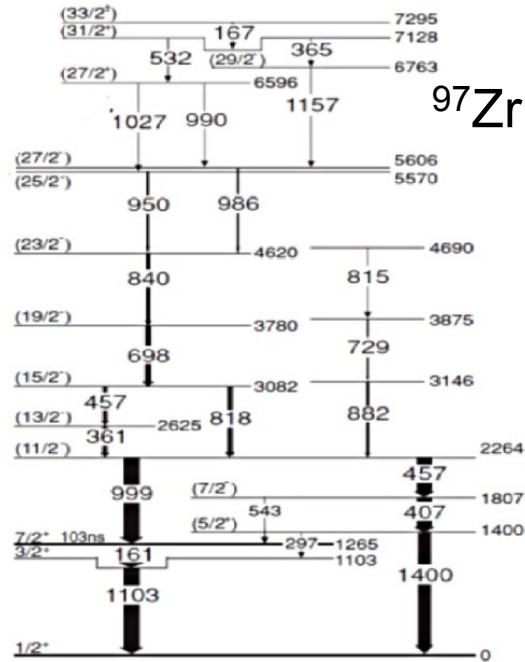
Gamma spectroscopy of neutron-rich isotopes in the $A = 100$ region produced in fission induced by cold neutrons with new FIPPS array

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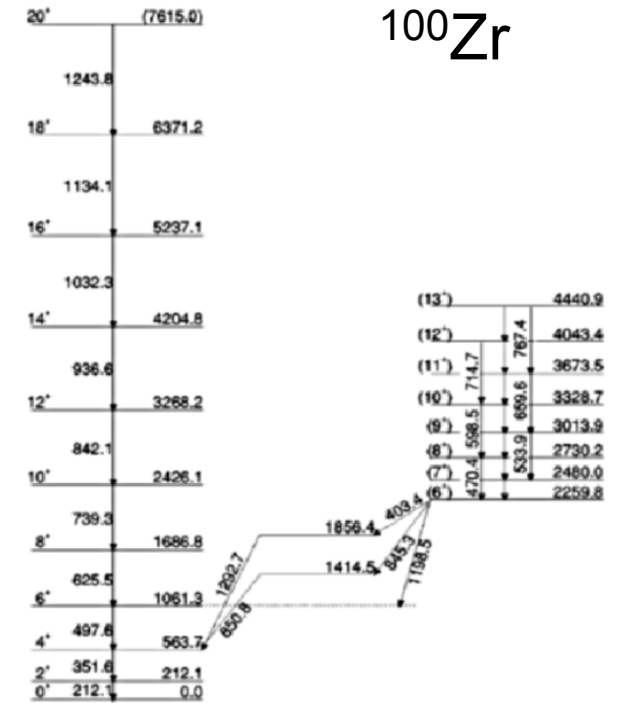
Scientific motivation

M. Matejska-Minda, B. Fornal et al., PRC 80, 017302(2009)



H. Hua et al., PRC 69, 014317 (2004)

^{100}Zr

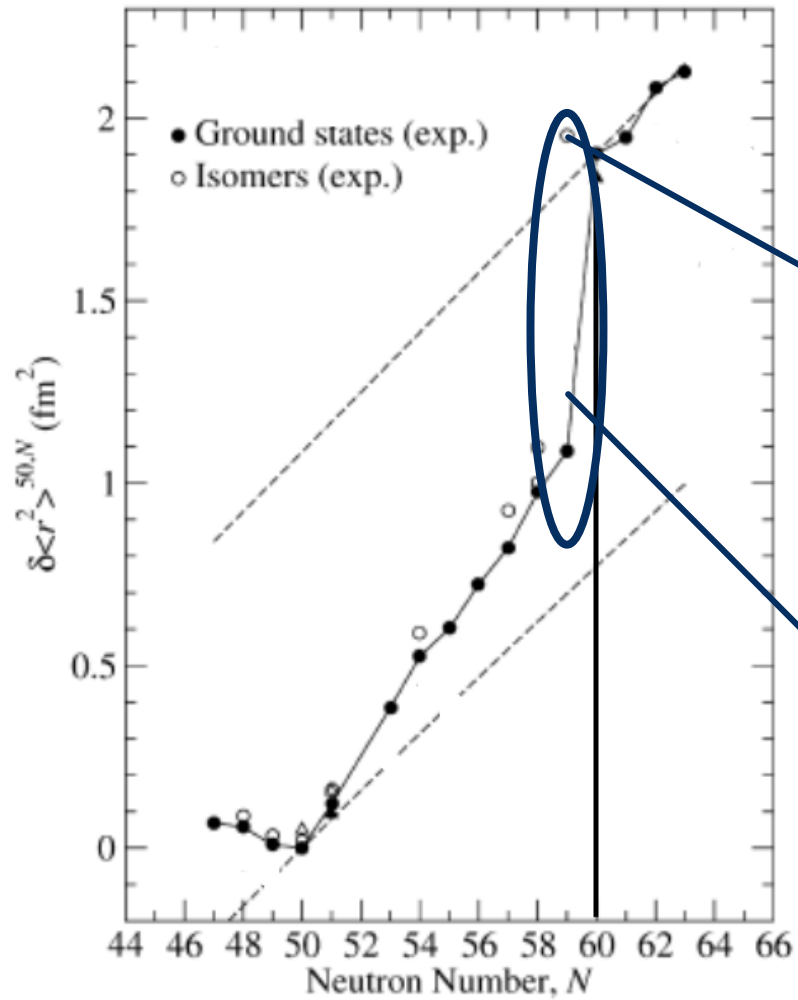


$Z = 40$

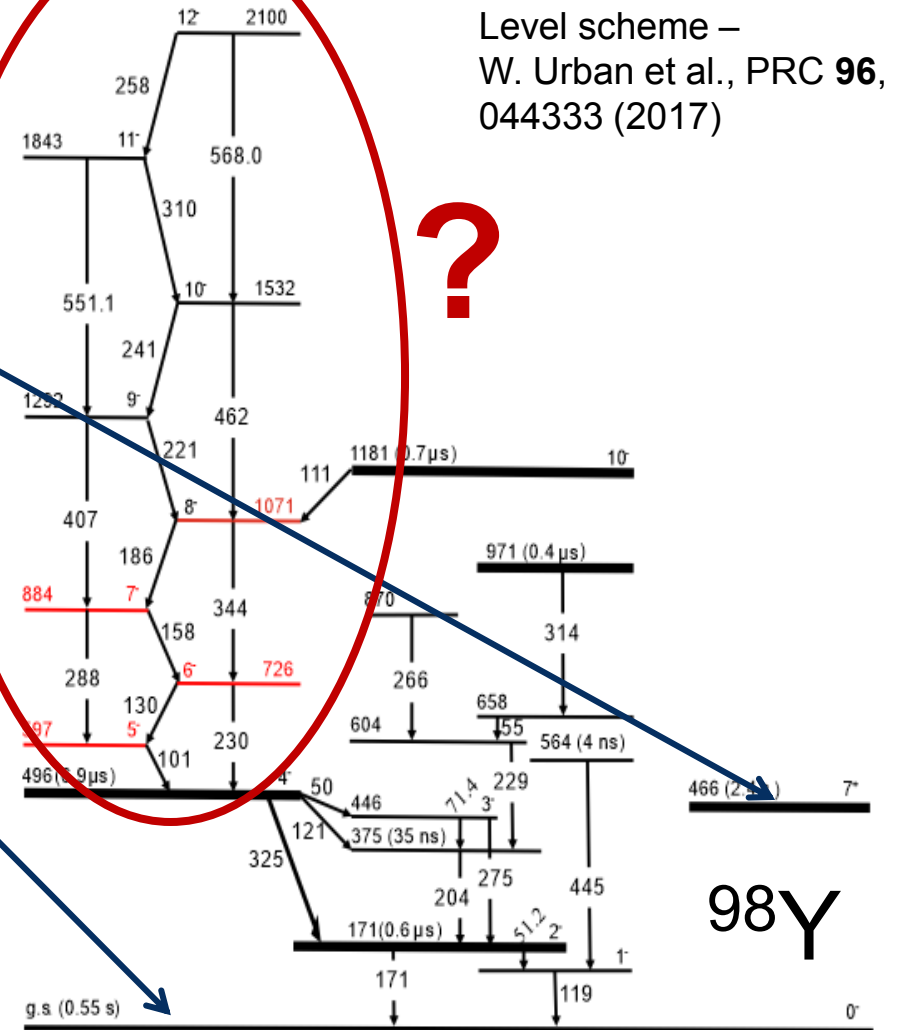
^{97}Nb	^{98}Nb	^{99}Nb	^{100}Nb	^{101}Nb	^{102}Nb	^{103}Nb
^{96}Zr	^{97}Zr	^{98}Zr	^{99}Zr	^{100}Zr	^{101}Zr	^{102}Zr
^{95}Y	^{96}Y	^{97}Y	^{98}Y	^{99}Y	^{100}Y	^{101}Y
^{94}Sr	^{95}Sr	^{96}Sr	^{97}Sr	^{98}Sr	^{99}Sr	^{100}Sr

$N = 60$

Scientific motivation



B. Cheal *et al.*, Phys Lett B **645**, 133-137 (2007).



Experimental details

EXILL

Institut Laue-Langevin (Grenoble)

- Cold neutrons from ILL reactor induced fission of ^{235}U and ^{241}Pu targets

Gamma spectroscopy HPGe (from EXOGAM and GASP)

- 10 clover detectors
- 6 large coaxial detectors

Lifetime measurements

- HPGe + 16 LaBr_3

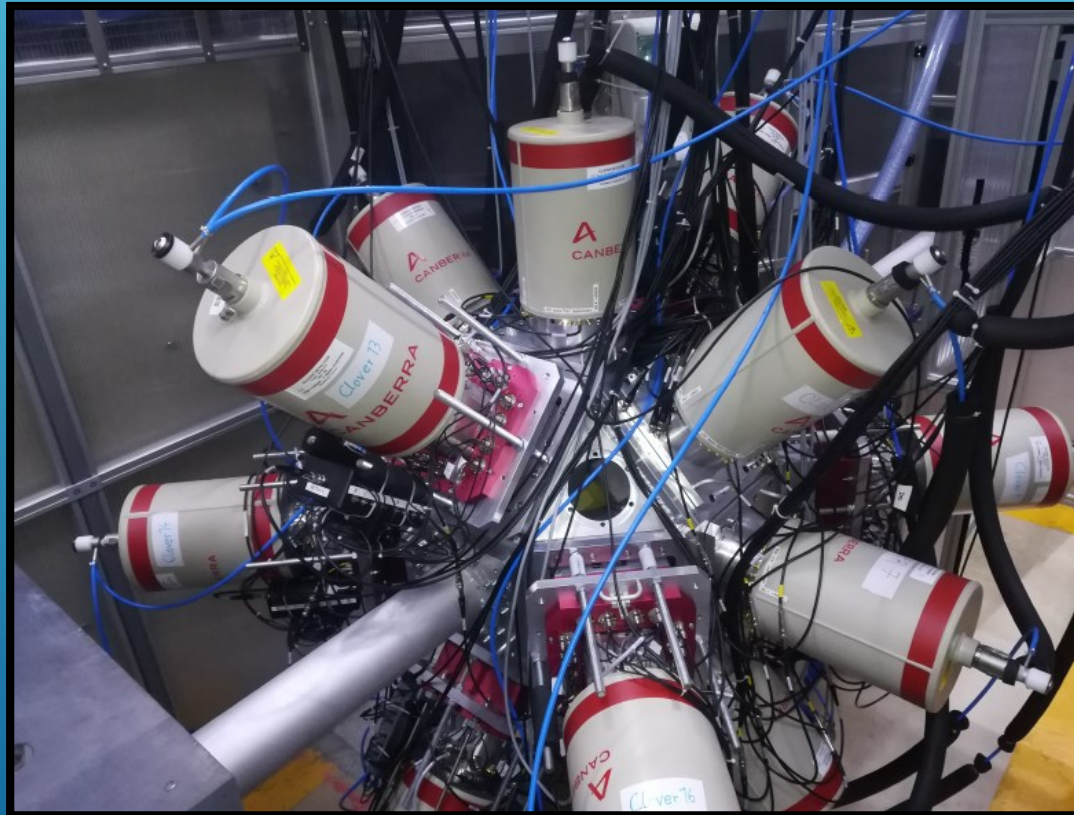
~ 50 days of measurement in 2012/13

M. Jentschel et al. JINST 12 (2017) P11003



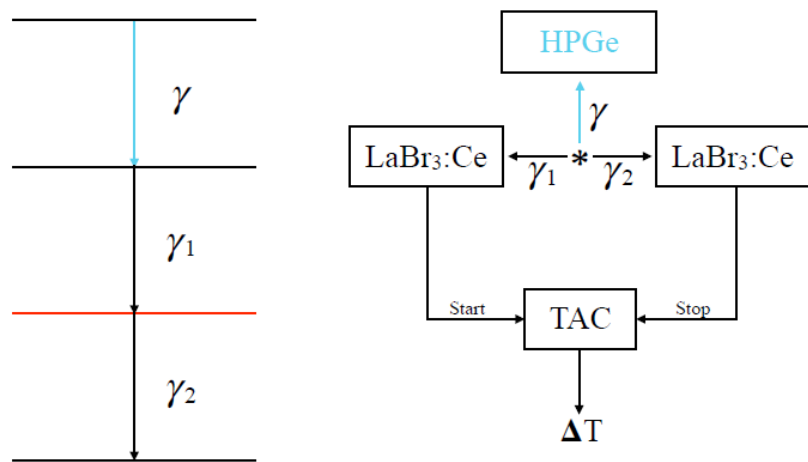
Setup upgrade

FIPPS (Fission Product Prompt γ -ray Spectrometer)

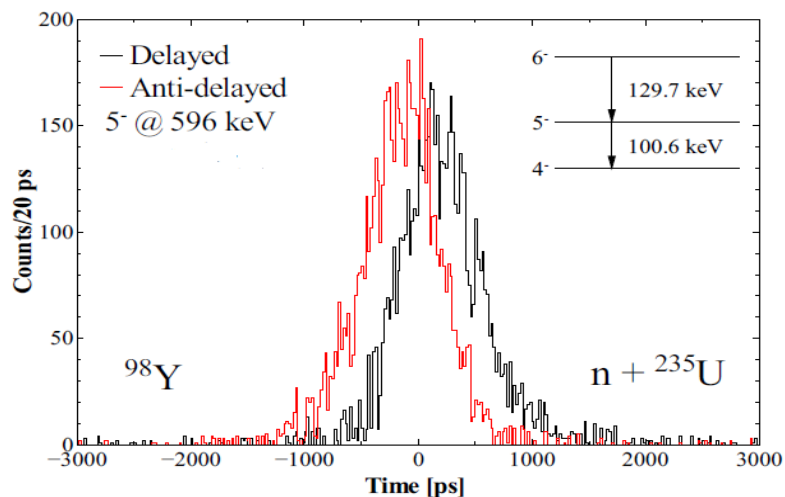


- 16 HPGe clover detectors
- cold-neutron from ILL reactor induced fission on **active** ^{235}U target
- 25 days of beam time in 2018
- about 50 days of beam time in 2019 (also with the ^{233}U target)

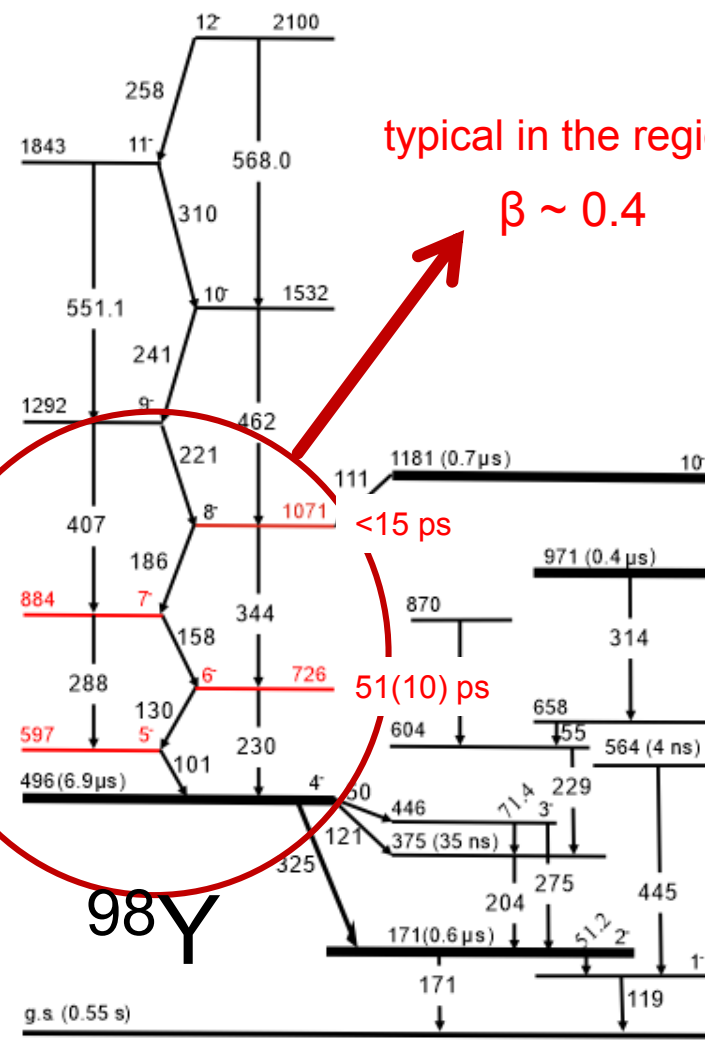
C. Michelagnoli et al., EPJ 193, 04009 (2018)

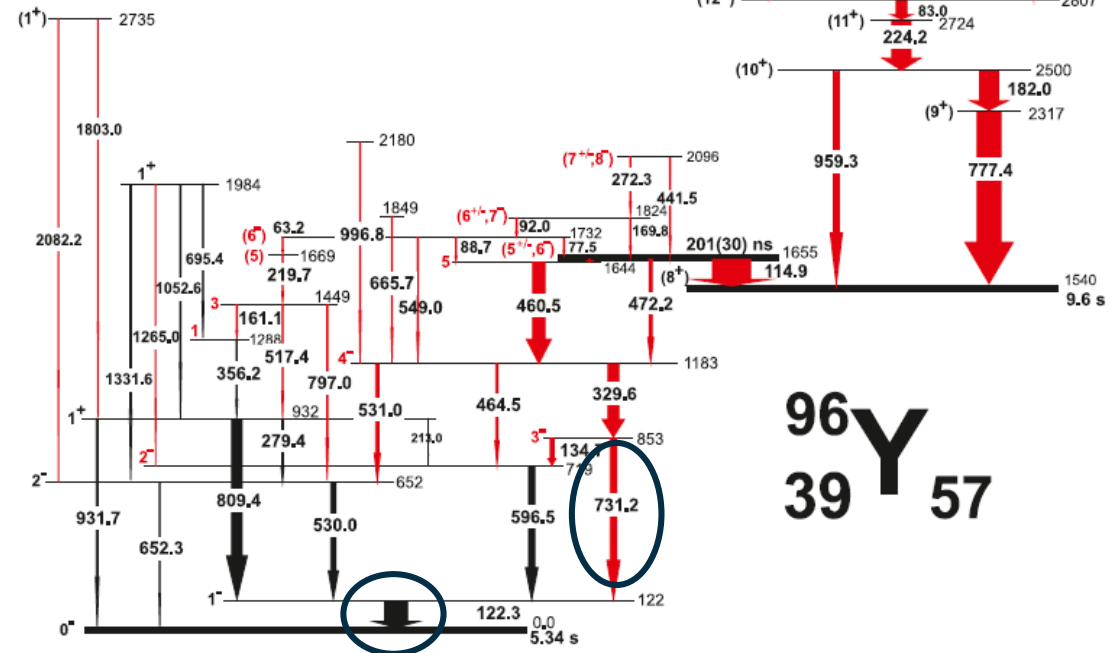


C. Porzio (bachelor thesis)
G. Bocchi et al



$T_{1/2} = 175(25) \text{ ps}$

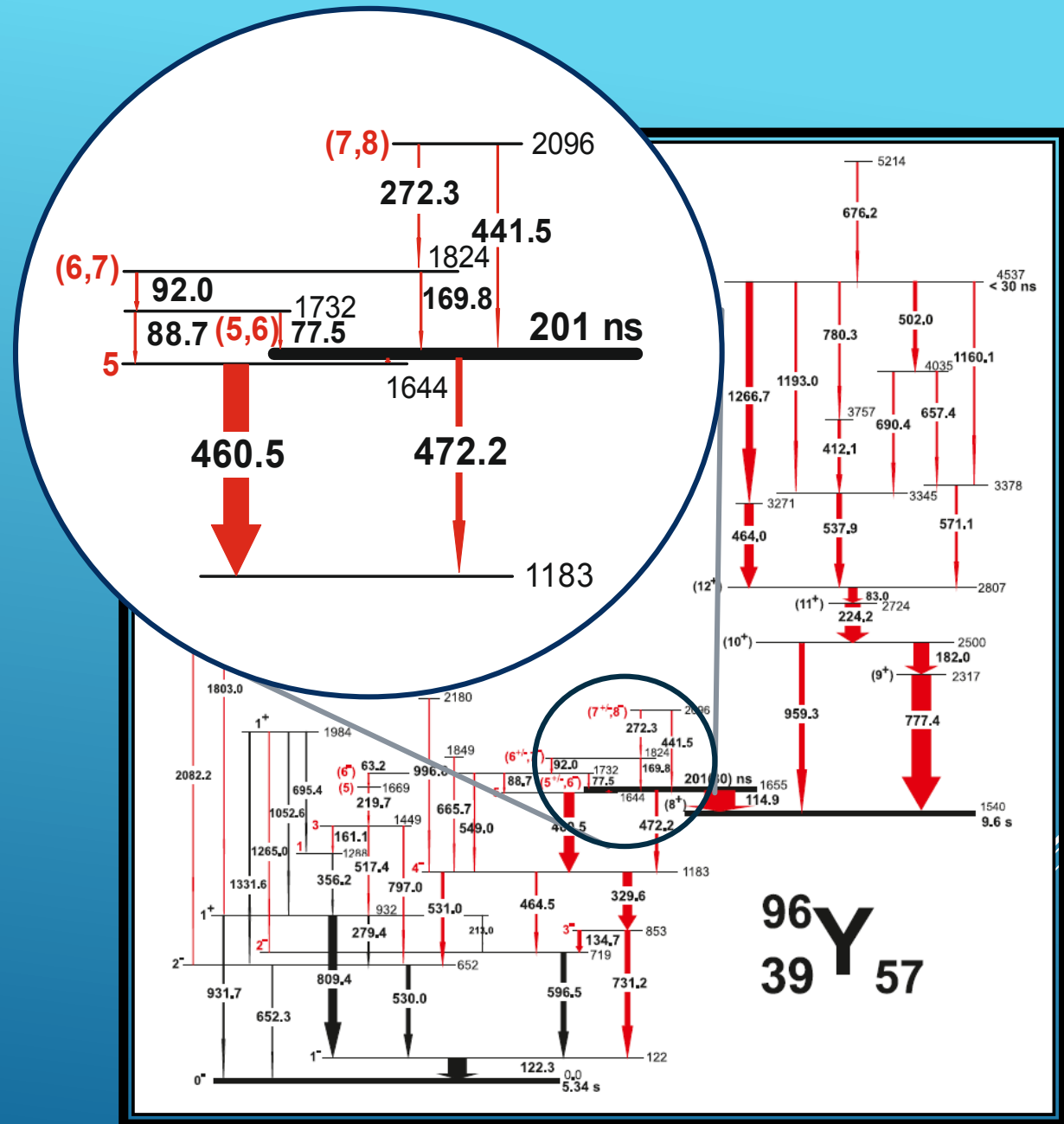



$${}_{39}^{96}\text{Y}_{57}$$

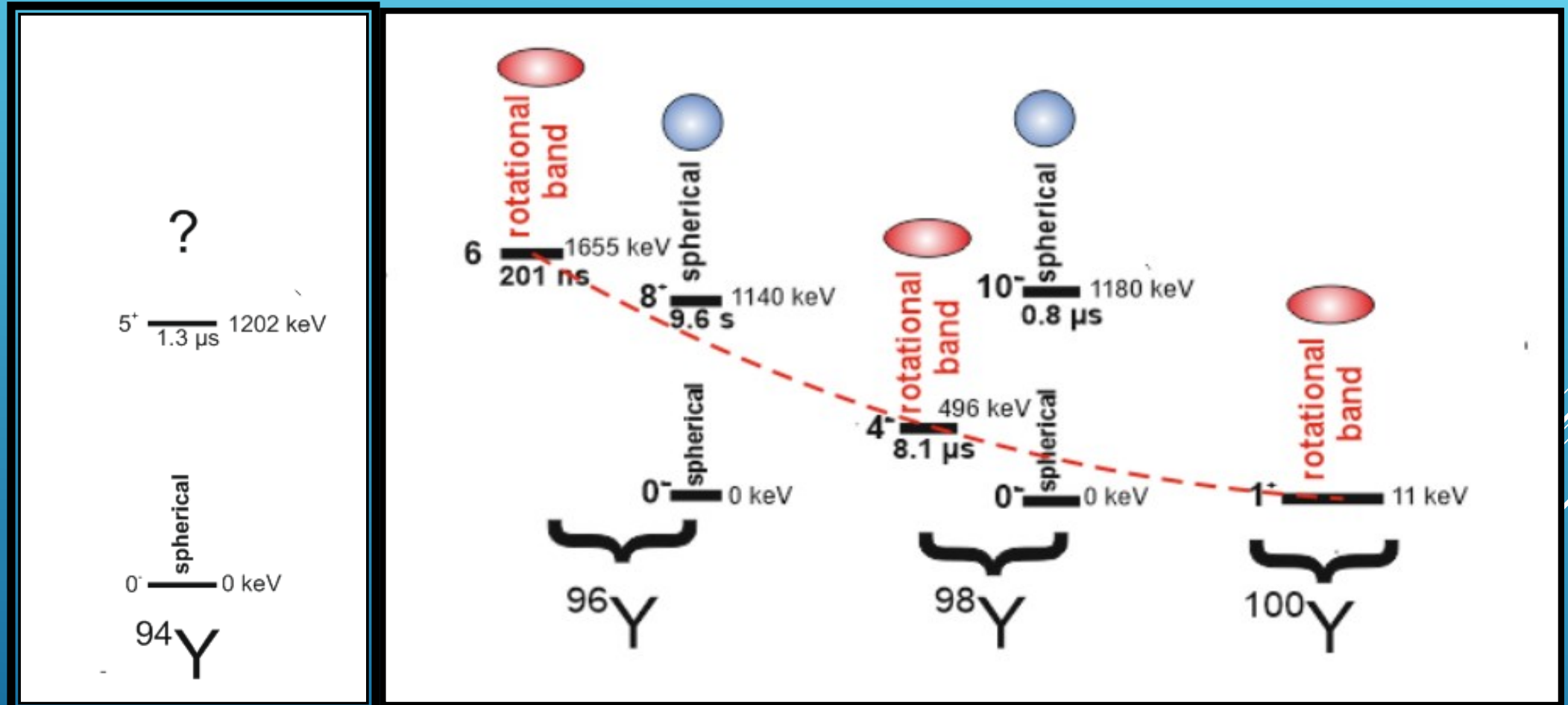
➤ No connections with a spherical structure above 8^+ isomer

➤ Theoretical calculation based on complex Monster (Vampir) model predicts the presence of a deformed 6^- isomer as a bandhead of a rotational prolate structure

➤ The structure above the isomer looks like a beginning of the rotational band

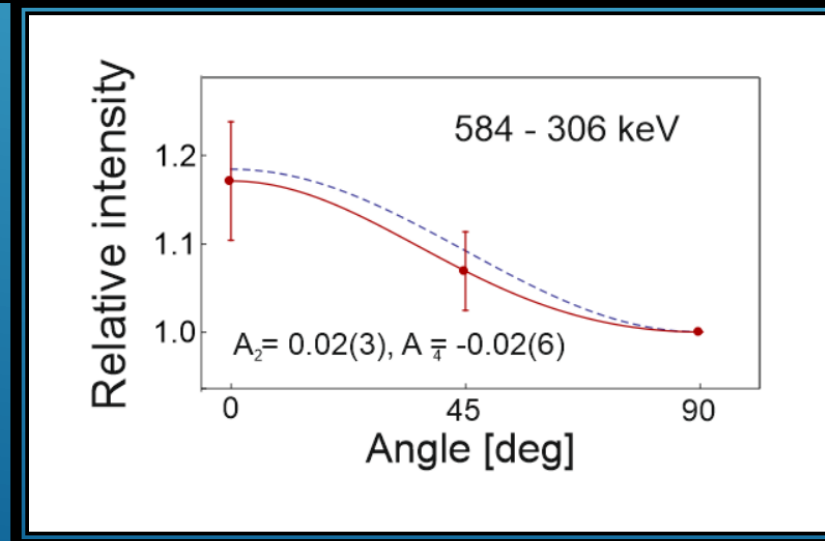
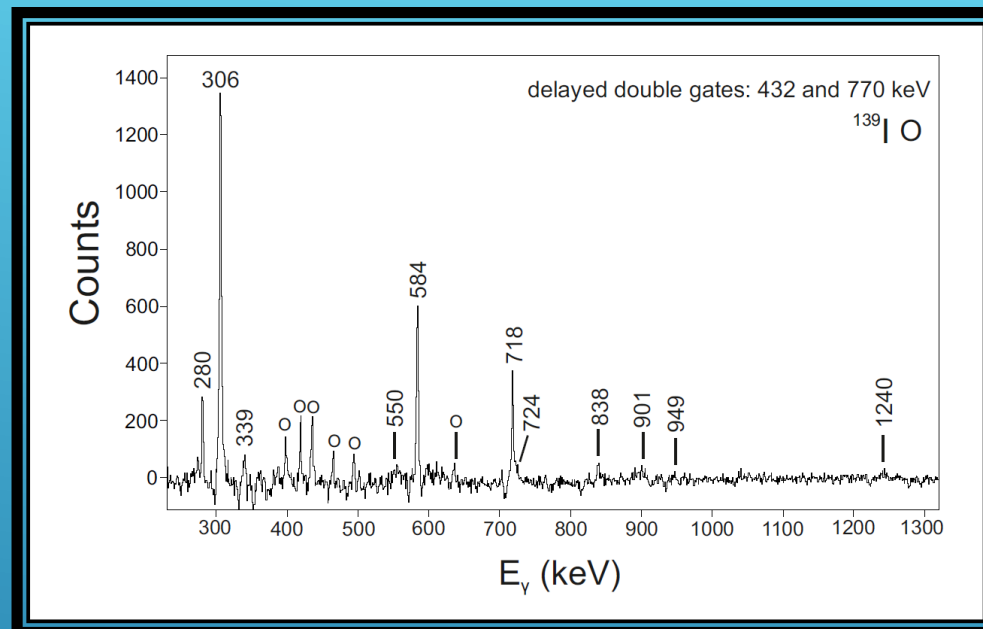
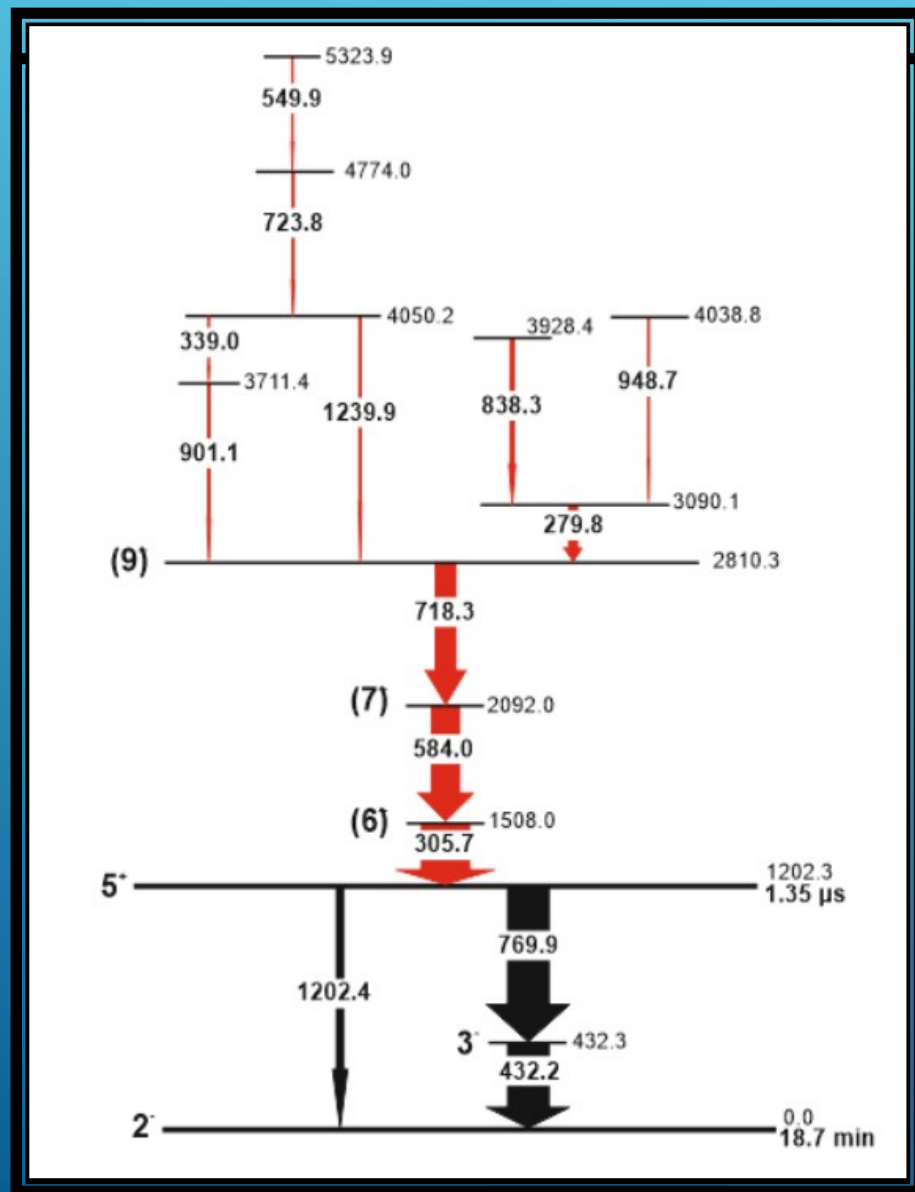


Shape evolution in the Y isotopic chain

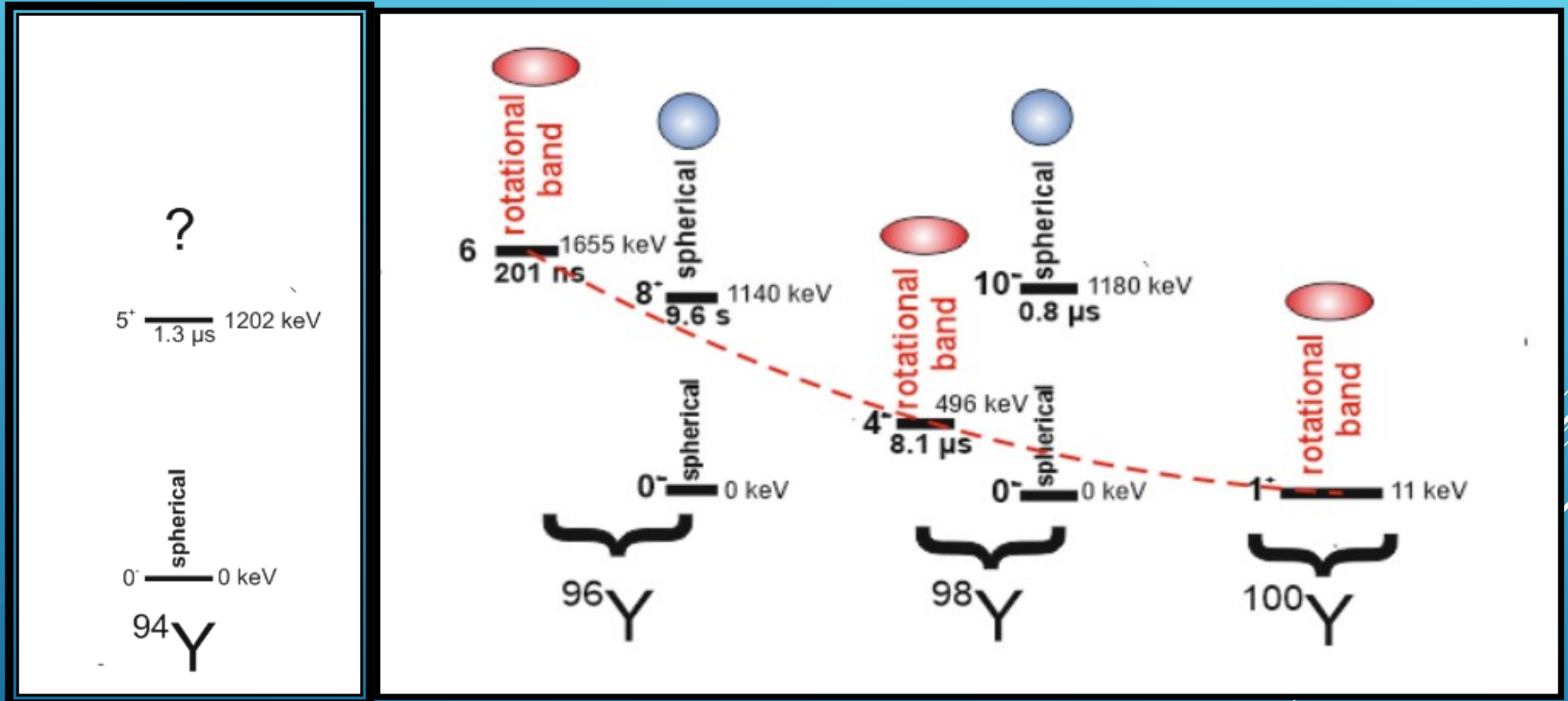


No sudden onset of deformation at N = 60 but gradually decrease in energy !?

Identification in the ^{94}Y isotope



Shape evolution in the Y isotopic chain



No sudden onset of deformation at $N = 60$ but gradually decrease in energy !?

Summary

Using the data from fission of ^{235}U and ^{241}Pu targets it was possible to identify over 50 new gamma transitions and 32 states in the $^{94,96}\text{Y}$ isotopes

Angular correlation analysis allowed to make spin-parity assignment for most of the identified levels

The analysis also revealed the presence of the new deformed isomeric state in the ^{96}Y as a bandhead of the possible rotational structure – first observation of the shape coexistence at $N = 57$

The recent results from the gamma spectroscopy study suggest that in case of yttrium isotopic chain we observe smooth evolution of the deformation rather than sudden onset

The future is bright! – different fissile targets and gas-filled magnet

Collaboration group

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(partial results)

Ł. W. Iskra *et al.*, p.64 Annual Report ILL (2017)

Ł. W. Iskra *et al.*, EPL 117, 12001 (2017)

Ł. W. Iskra *et al.*, Acta Phys. Pol. B 48, 581 (2017)

Ł. W. Iskra *et al.*, Phys. Scripta, 92, 10 (2017)

**Thank you
for your attention**