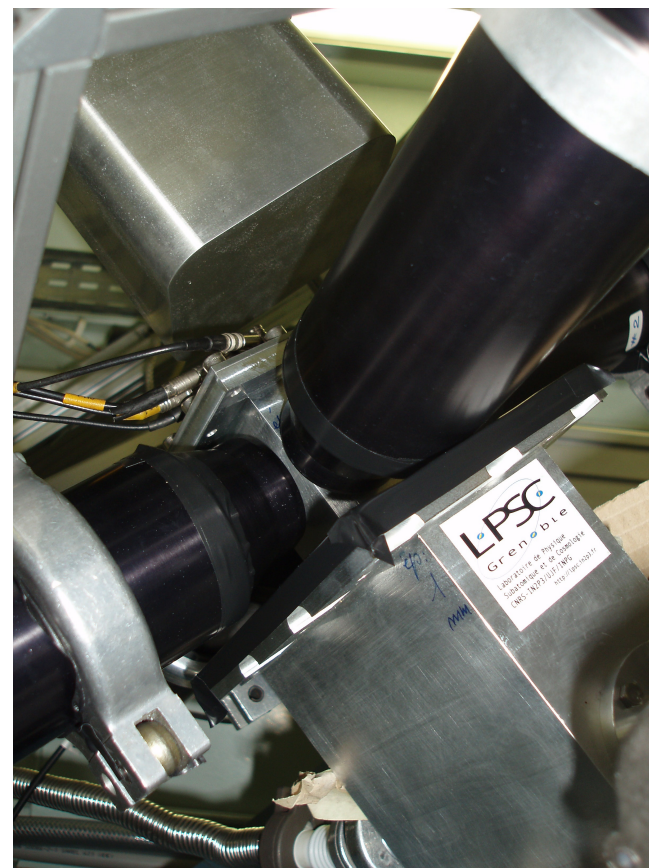
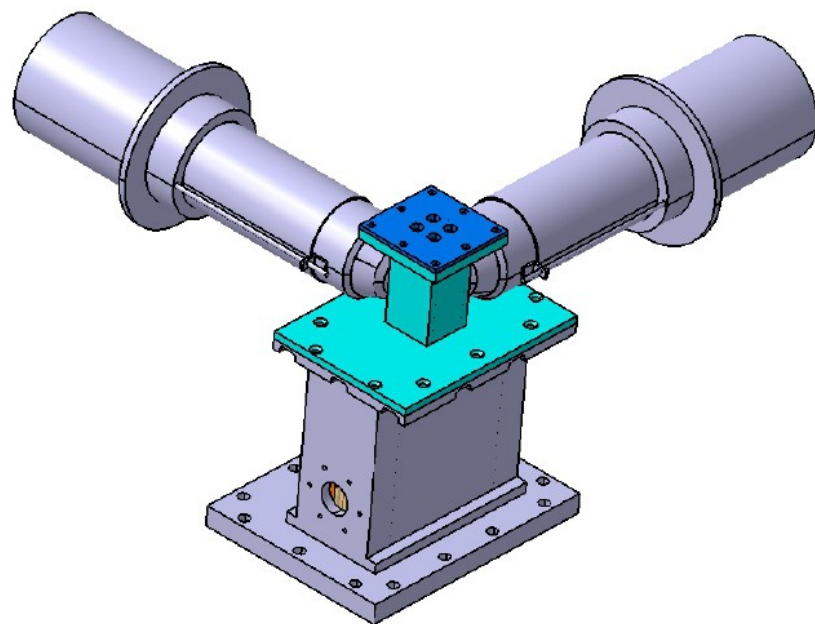


Fast-timing lifetime measurements of states below μ s isomers

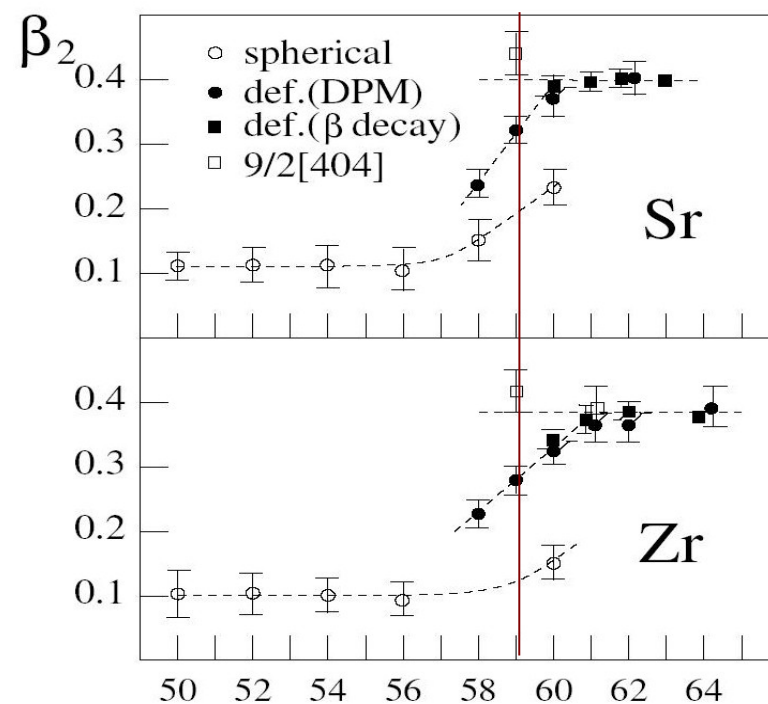
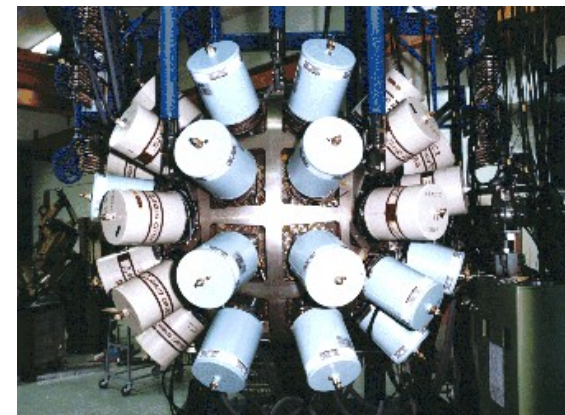
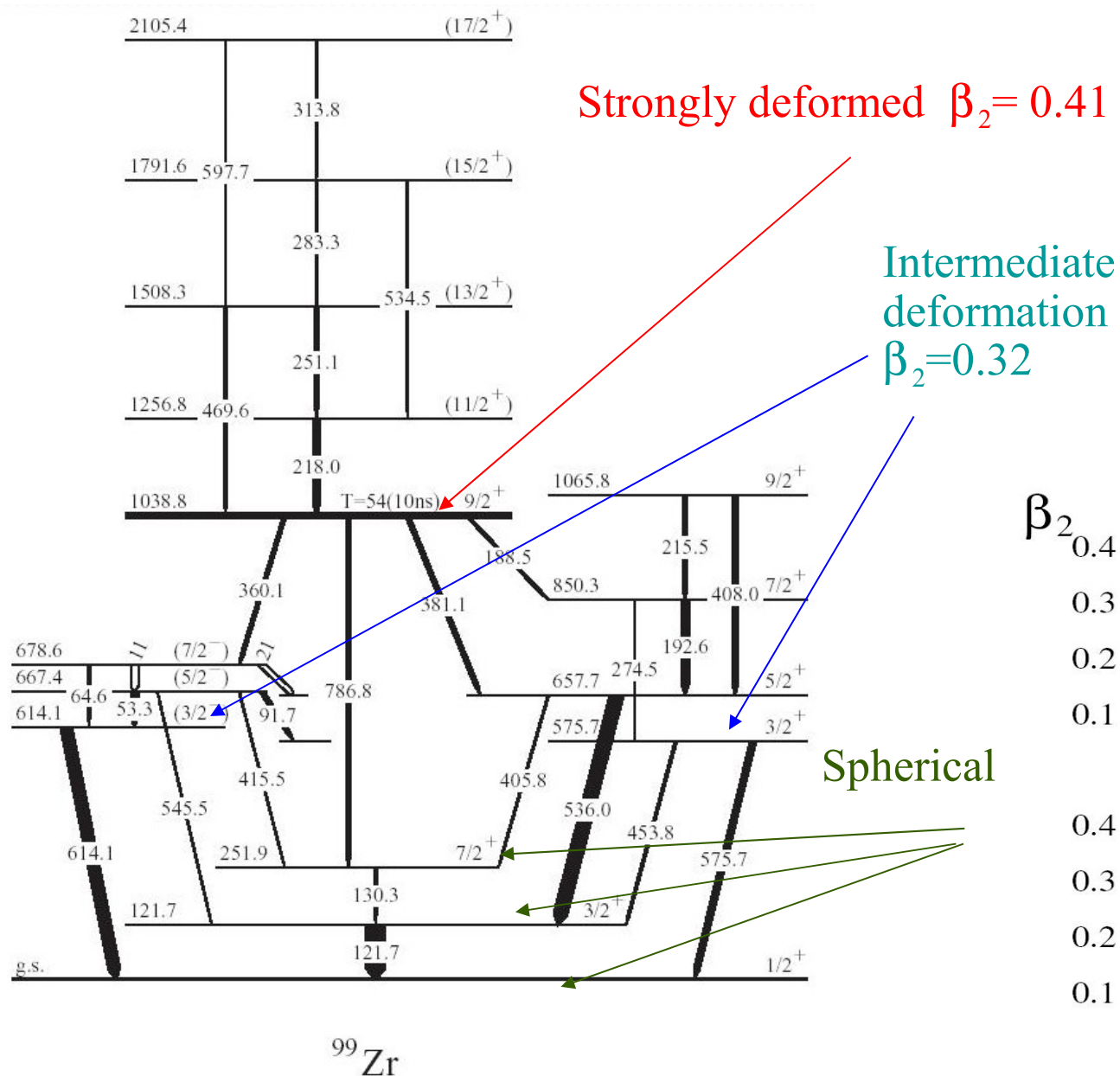
- probing shape coexistence in the A=100
region

Gary Simpson, LPSC Grenoble

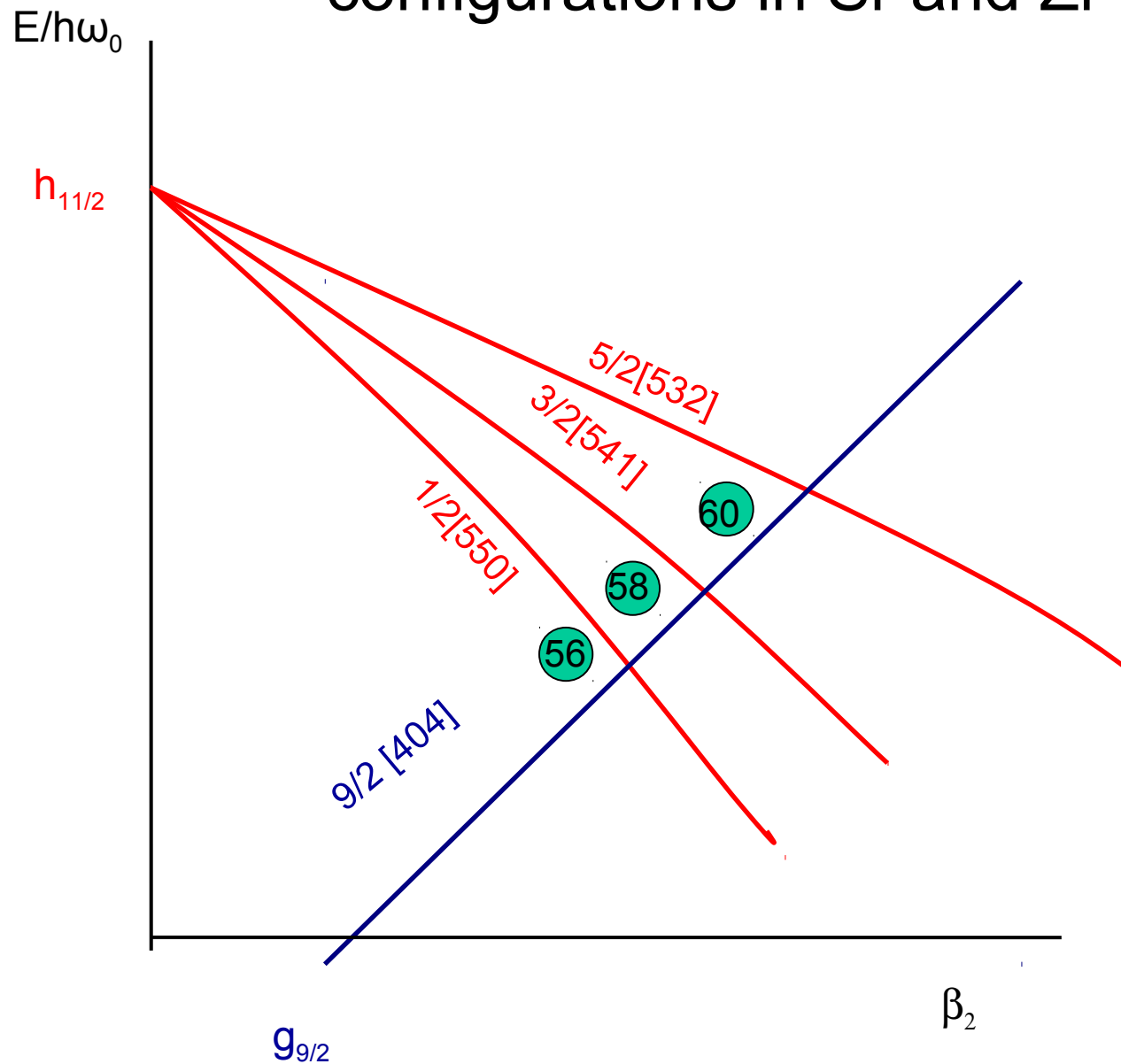


Combination of Eurogam II and Lohengrin data

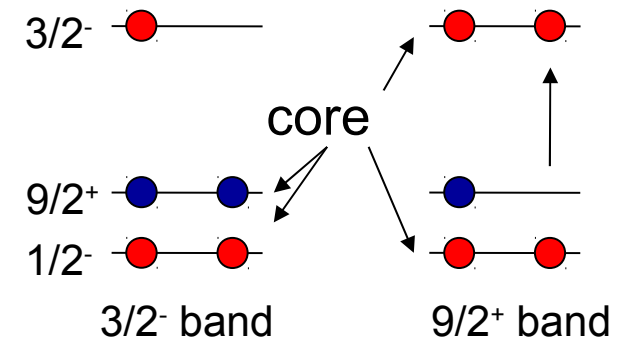
Observation of 3 different shapes in $^{99,101}\text{Zr}$ and ^{97}Sr



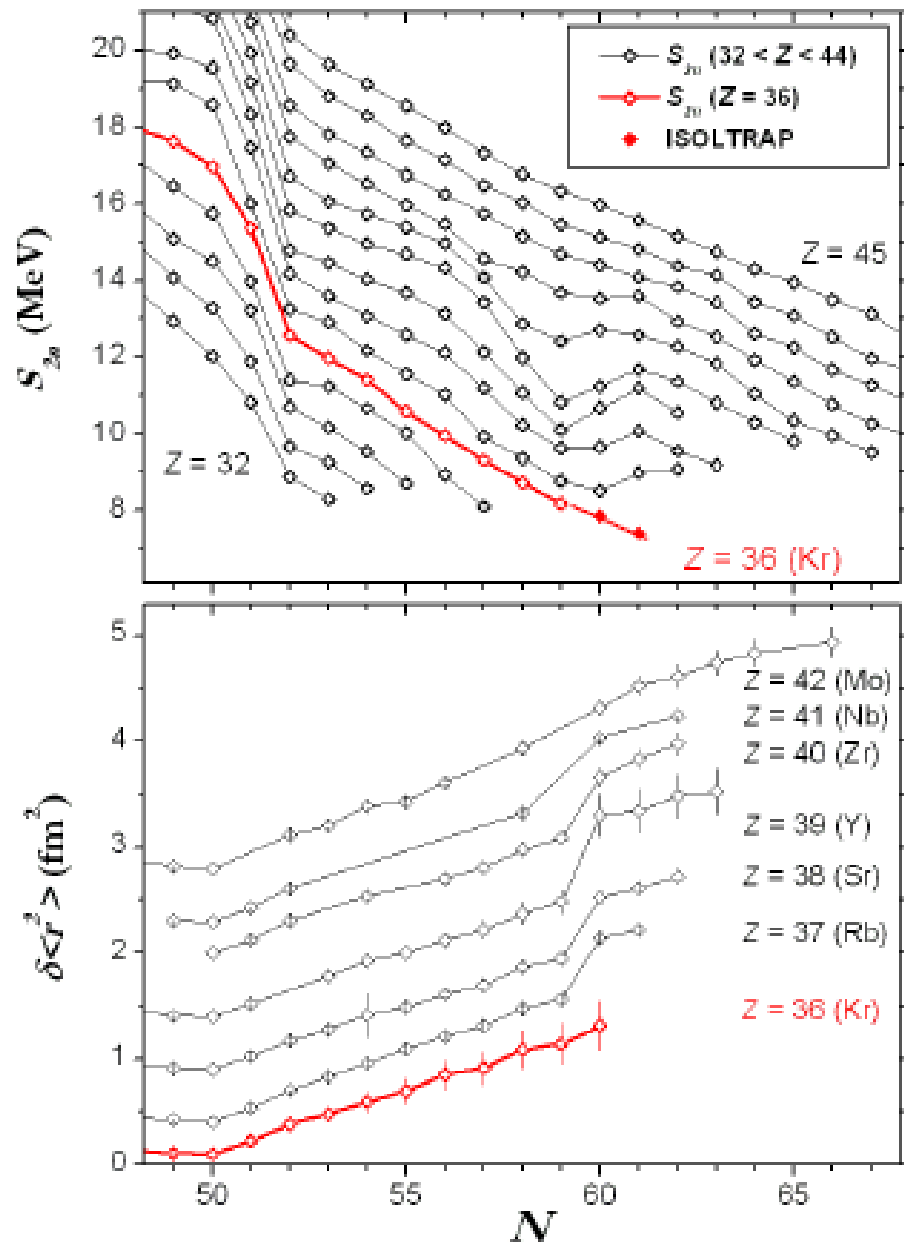
Schematic representations of deformed configurations in Sr and Zr isotones



N=59

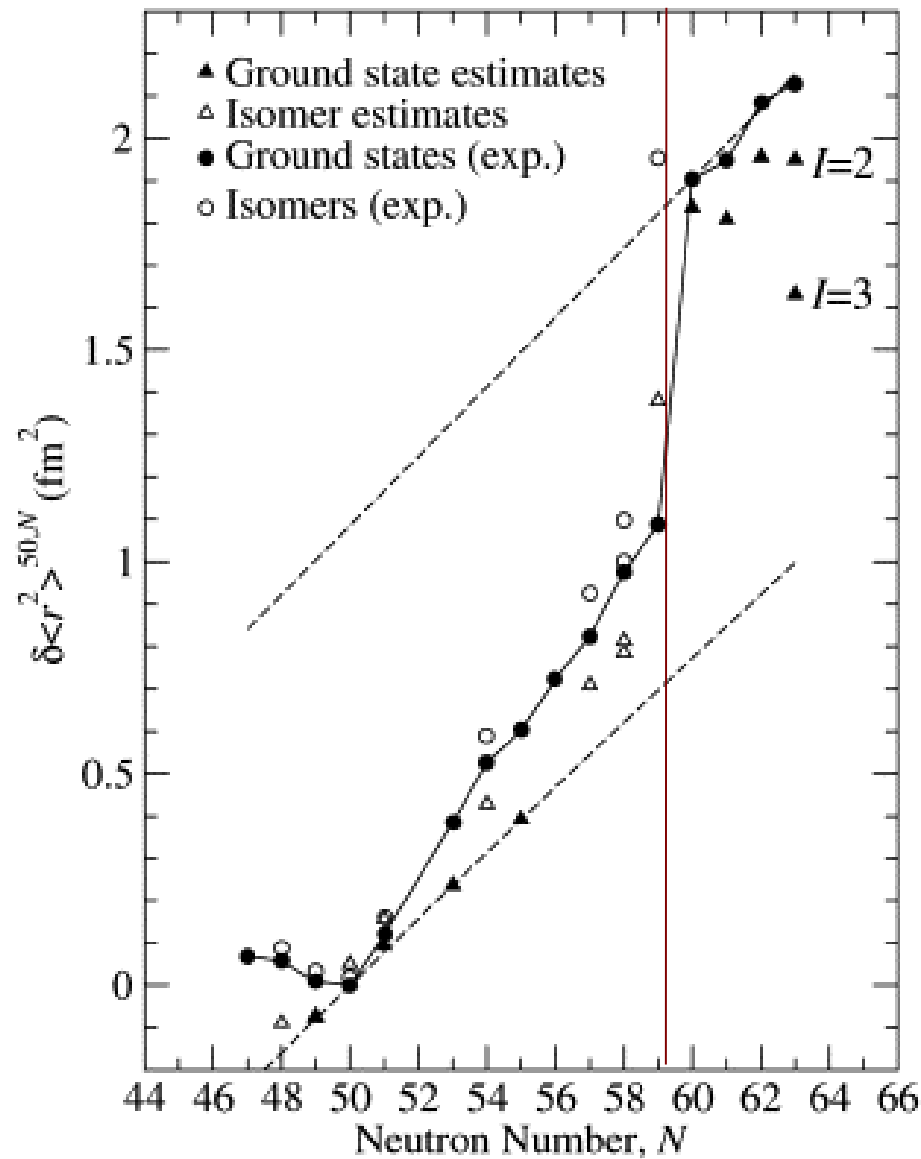


Kr nuclei



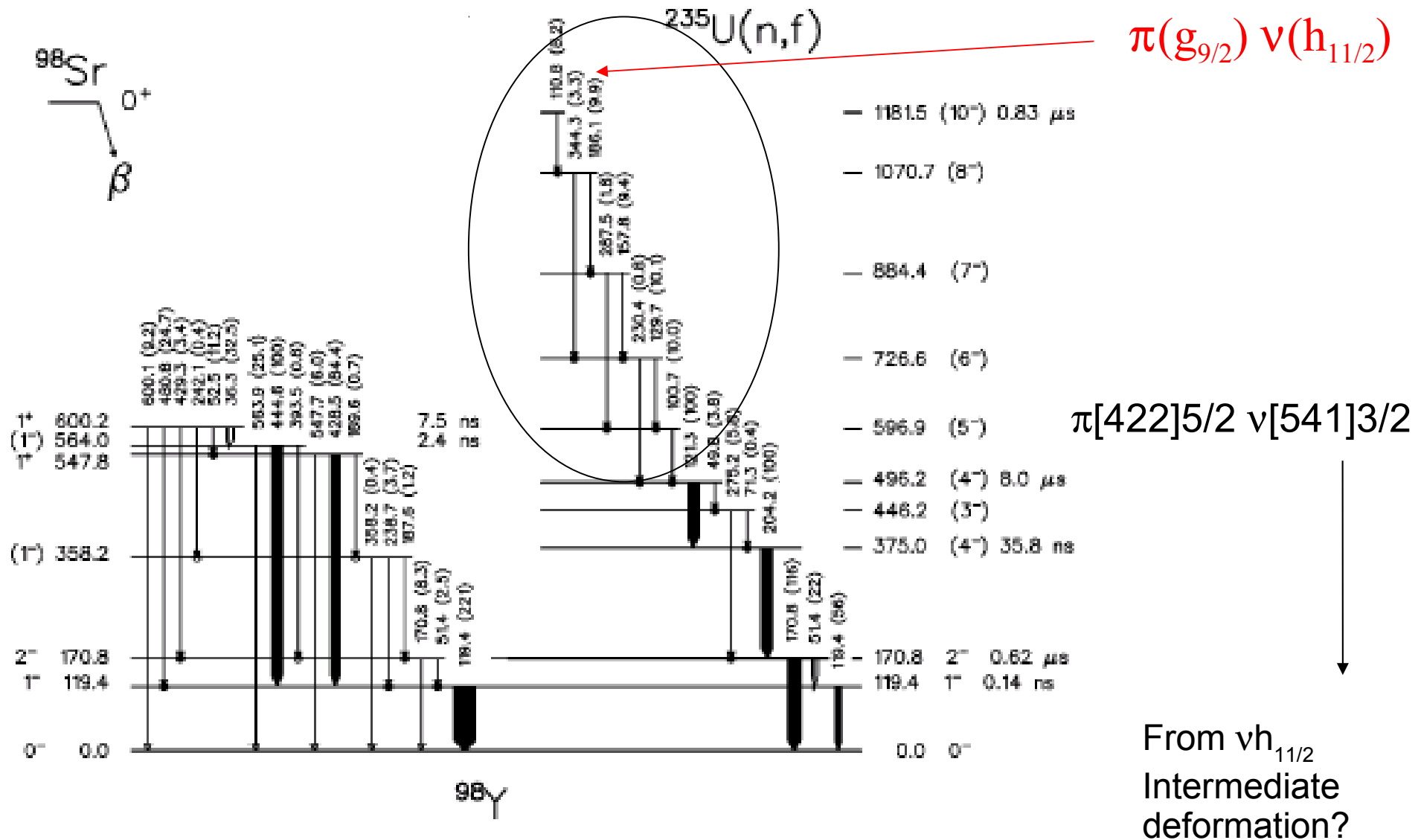
S. Naimi *et al.* Phys. Rev. Lett. 105 (2010) 032502

M. Keim *et al.* Nucl. Phys. A586 (1995) 219



Yttrium isotopes
show shape
change and
coexistence

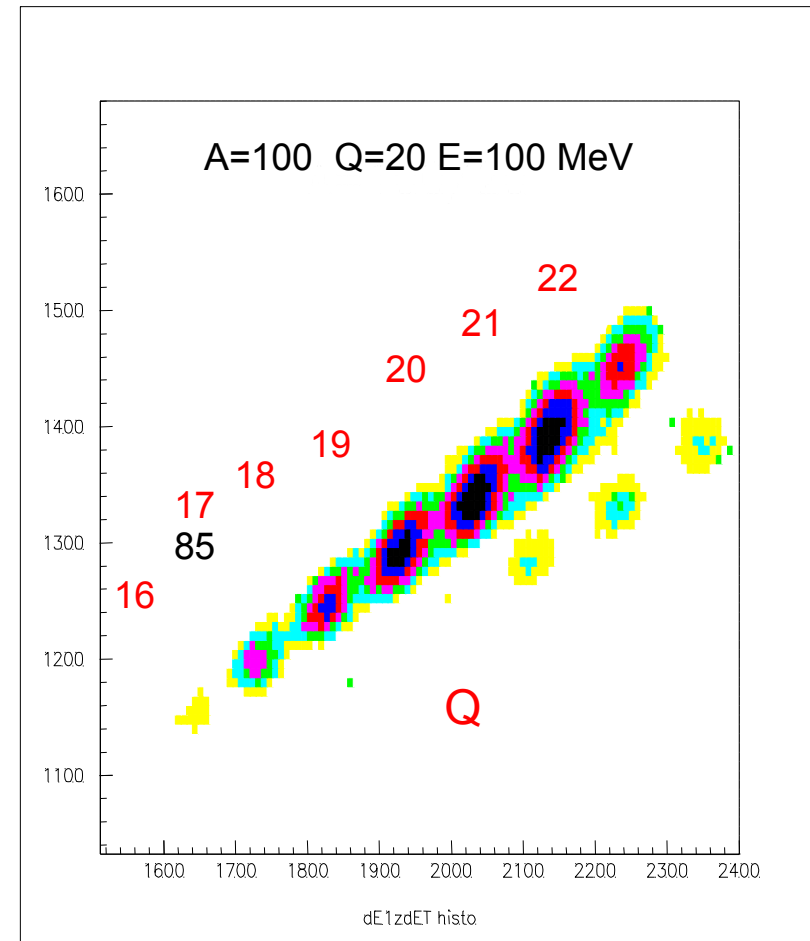
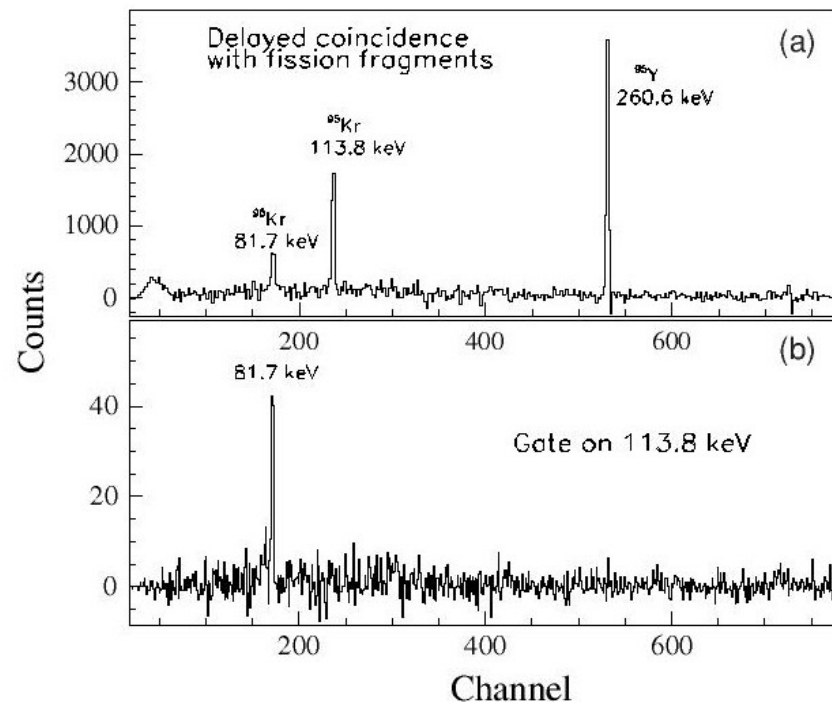
B. Cheal *et al.* Phys. Lett. B
645 (2007) 133



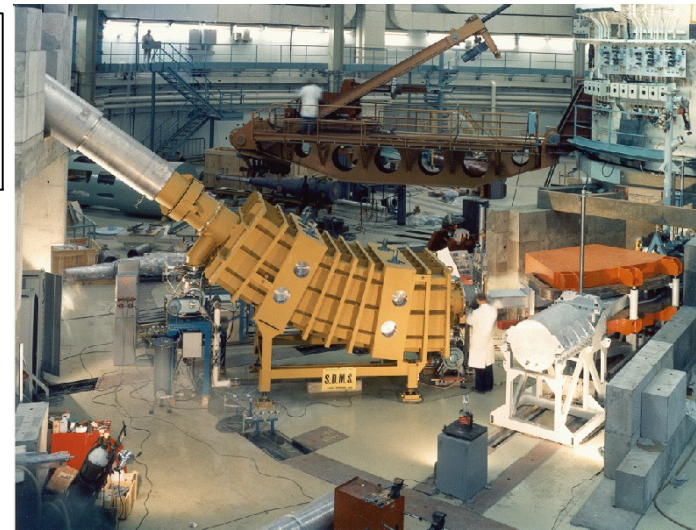
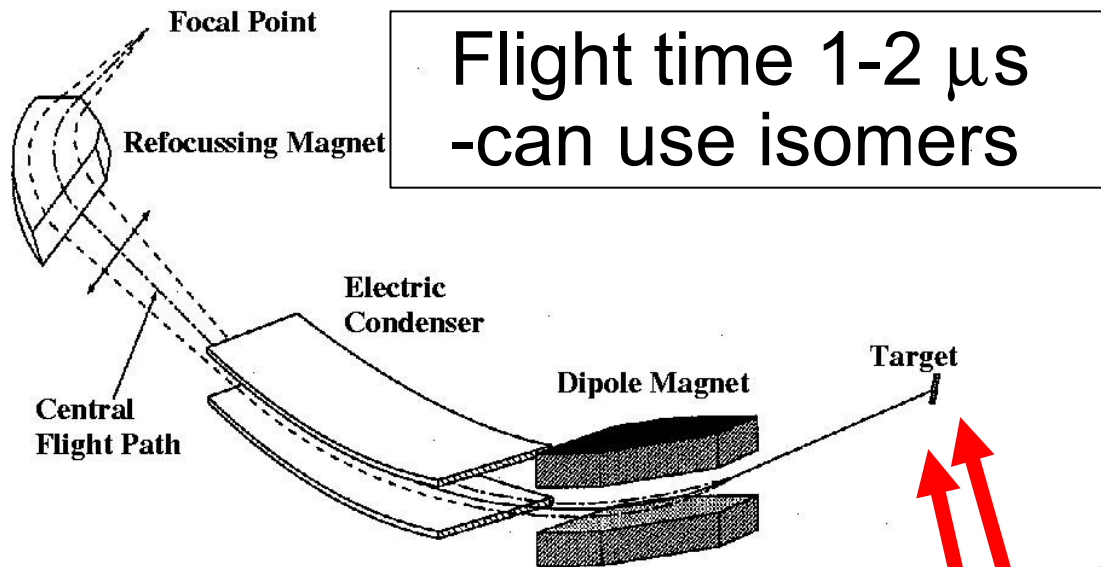
Brant *et al.*, Phys. Rev. C 69 034327 (2004)

Mass-Separated Isomers

- allows study of very weakly produced nuclei.
- by use of the mass separation of the spectrometer
- by use of a narrow gate in time (microseconds)
- very clean technique



The Lohengrin Fission-Product Spectrometer



Separates according to A/q and v/q

No ion source - no chemical selectivity

$\sim 2 \times 10^{12}$ fissions/s
(3.5 mg of ^{239}Pu 742 b)

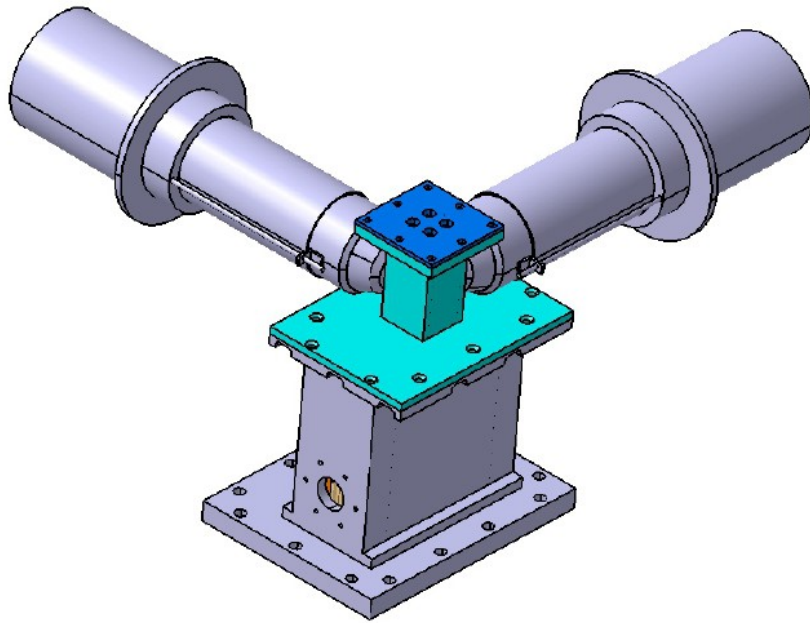
$A/\delta A \sim 250$

Solid angle $< 2 \times 10^{-5}$

Rates at focal point
 ~ 3000 ions of ^{132}Sn /s

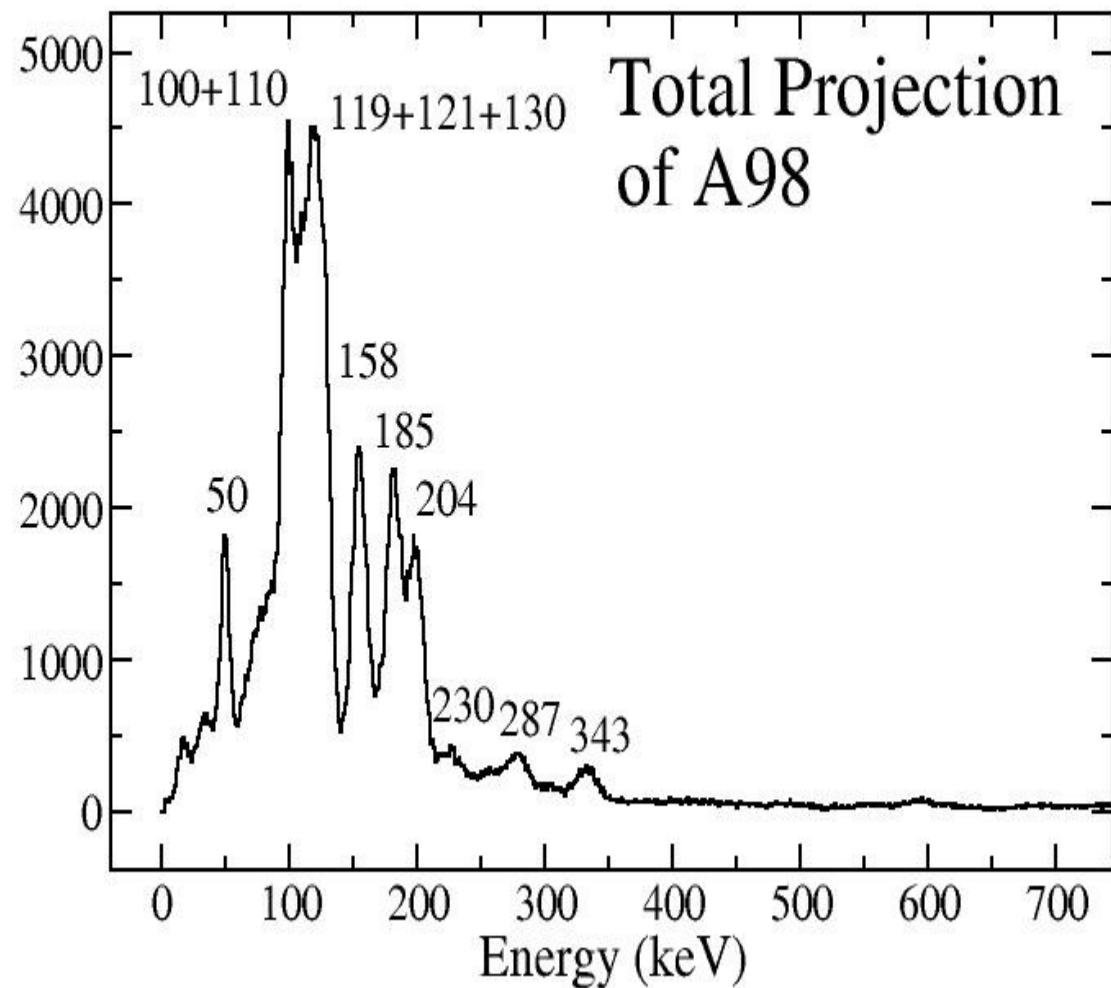
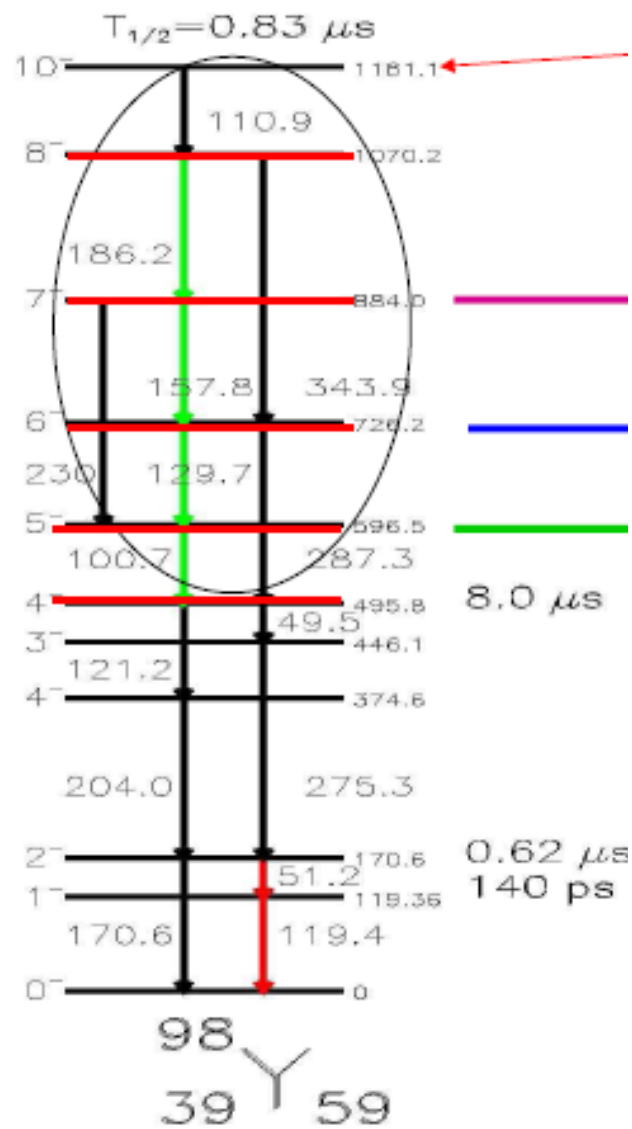
Focal point $\sim 6 \text{ cm} \times 1.5 \text{ cm}$

Setup

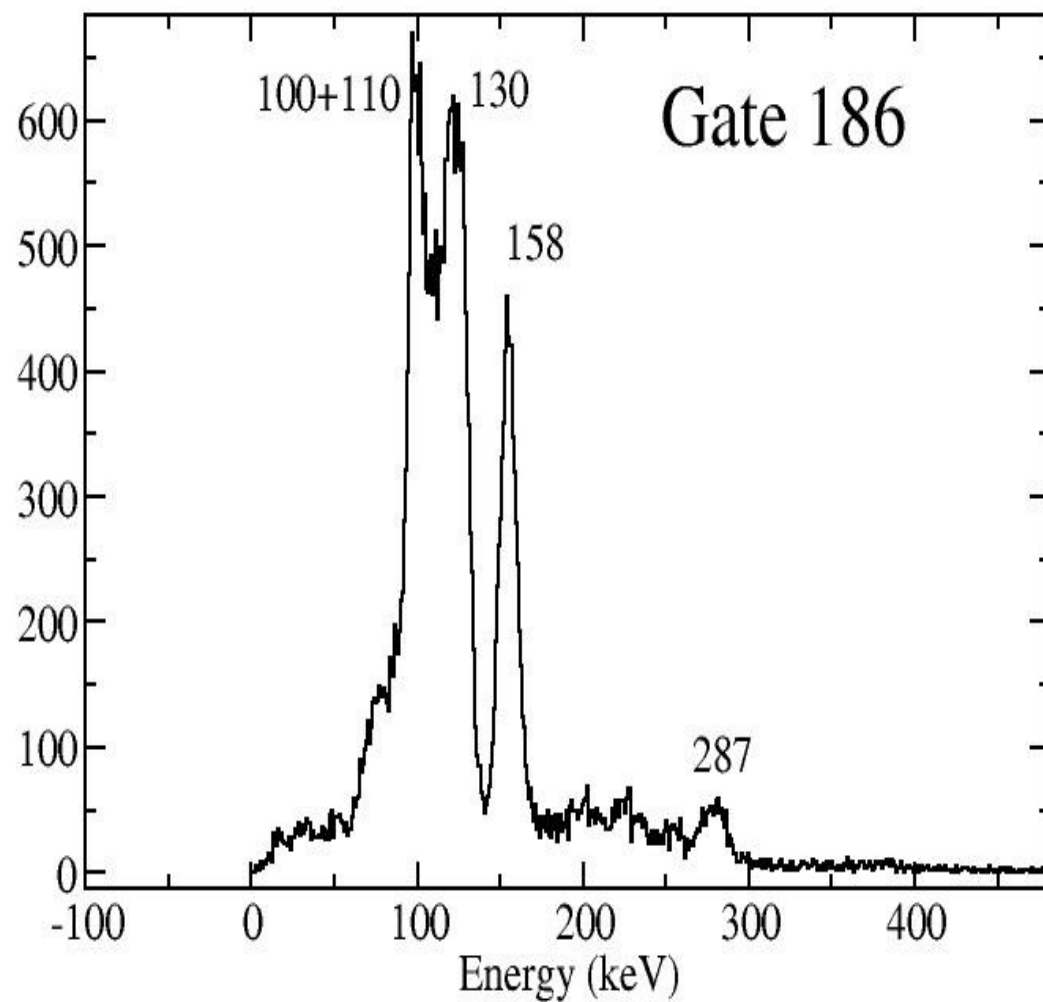
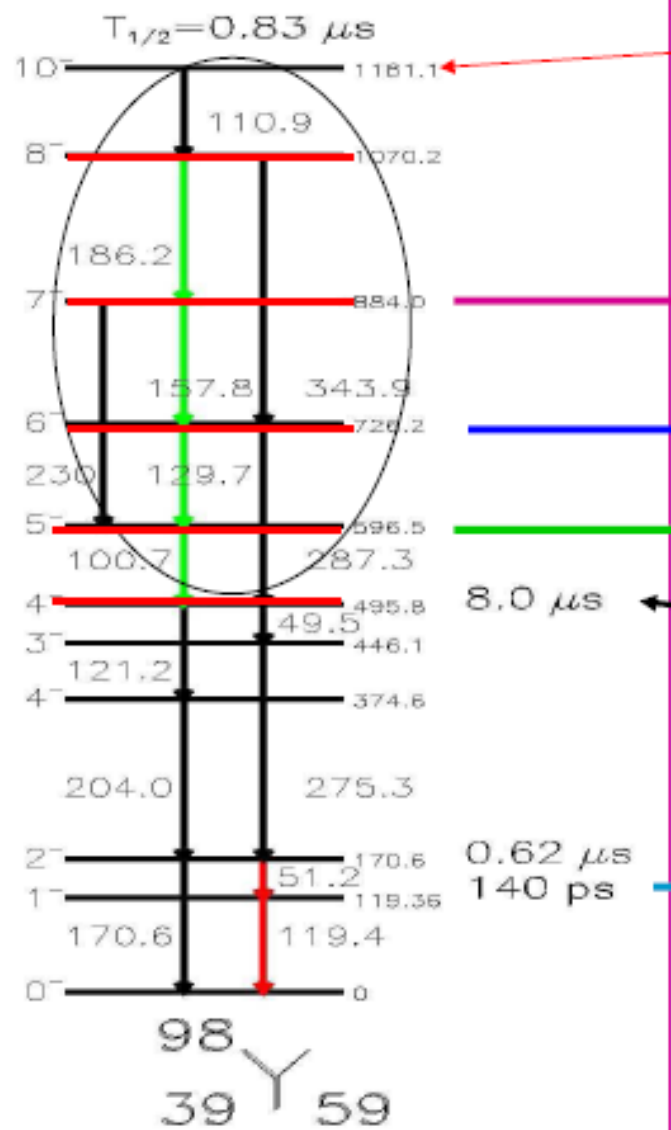


x4 LaBr3 detectors
x4 PIN diodes
Ionisation chamber
x6 TACS
XIA acquisition system

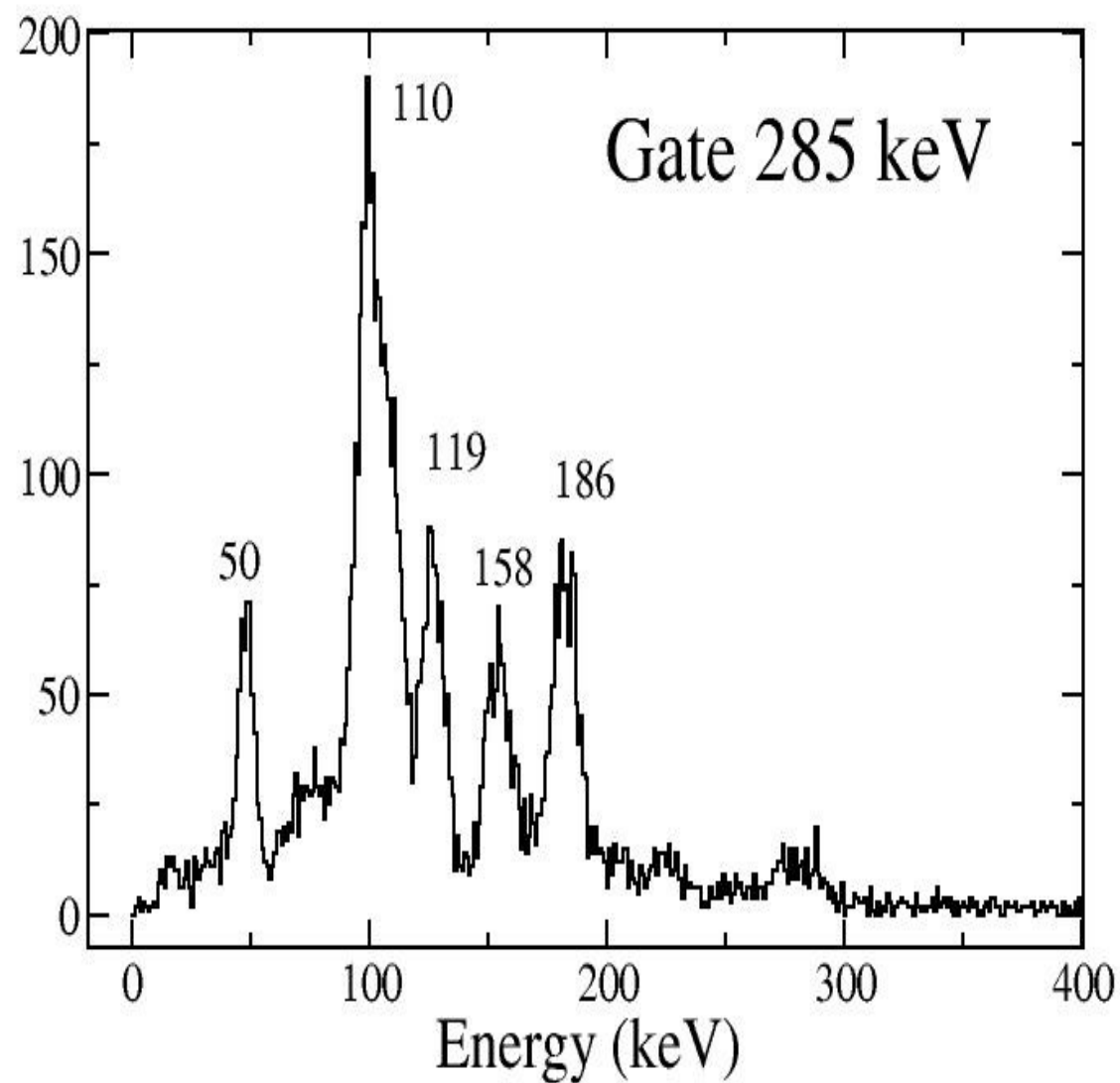
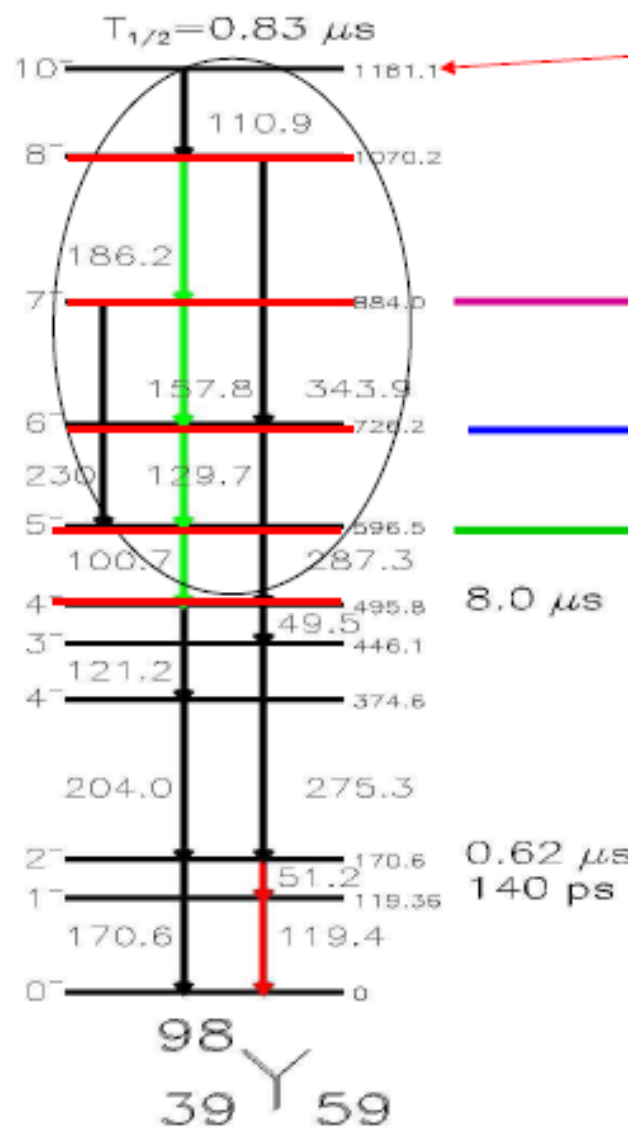
^{98}Y ion of interest



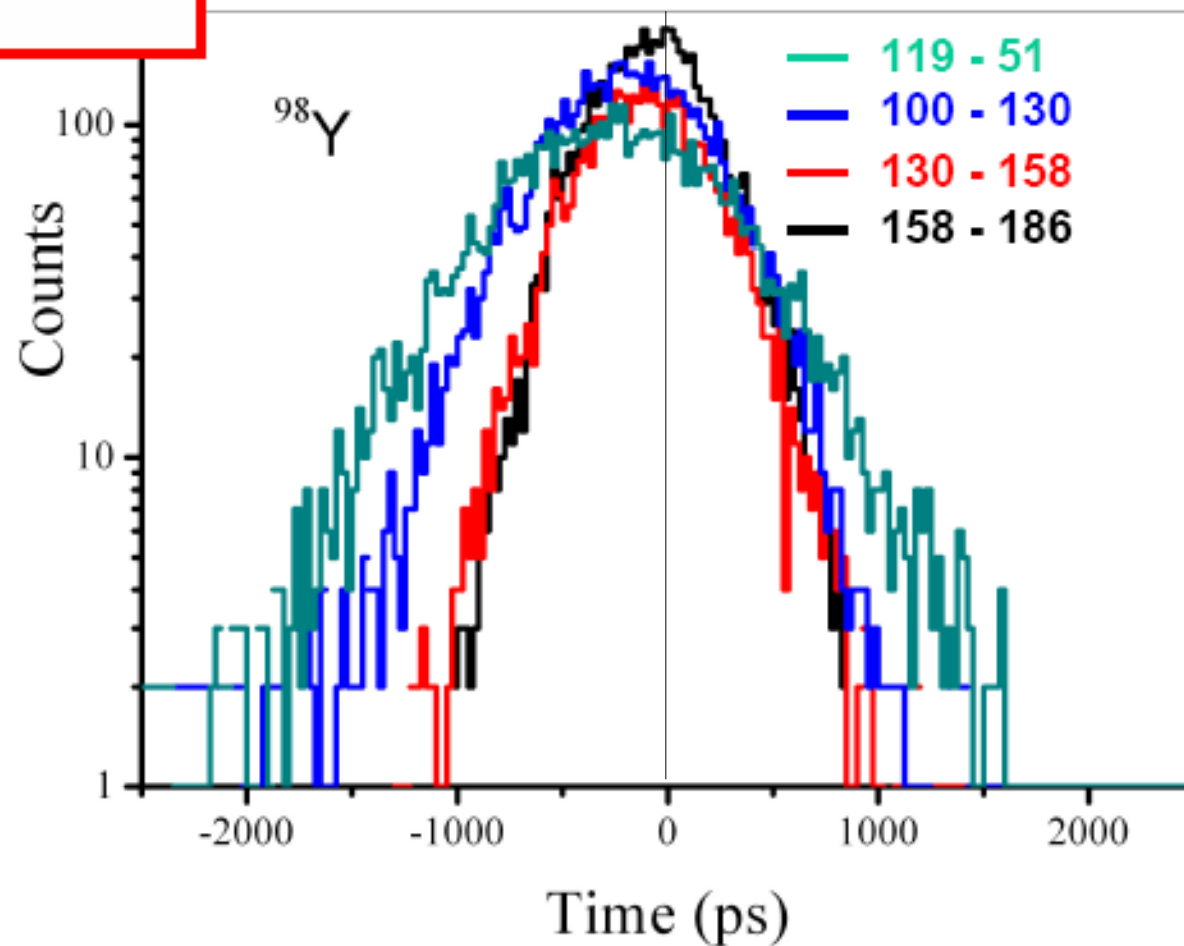
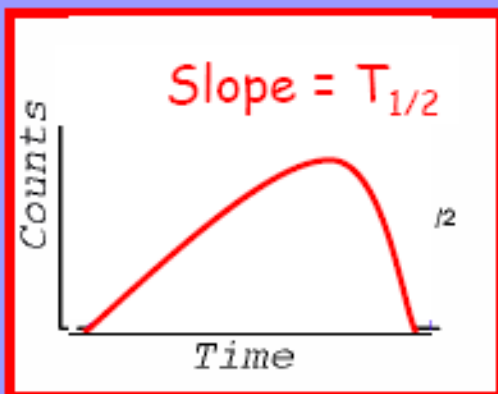
⁹⁸Y ion of interest



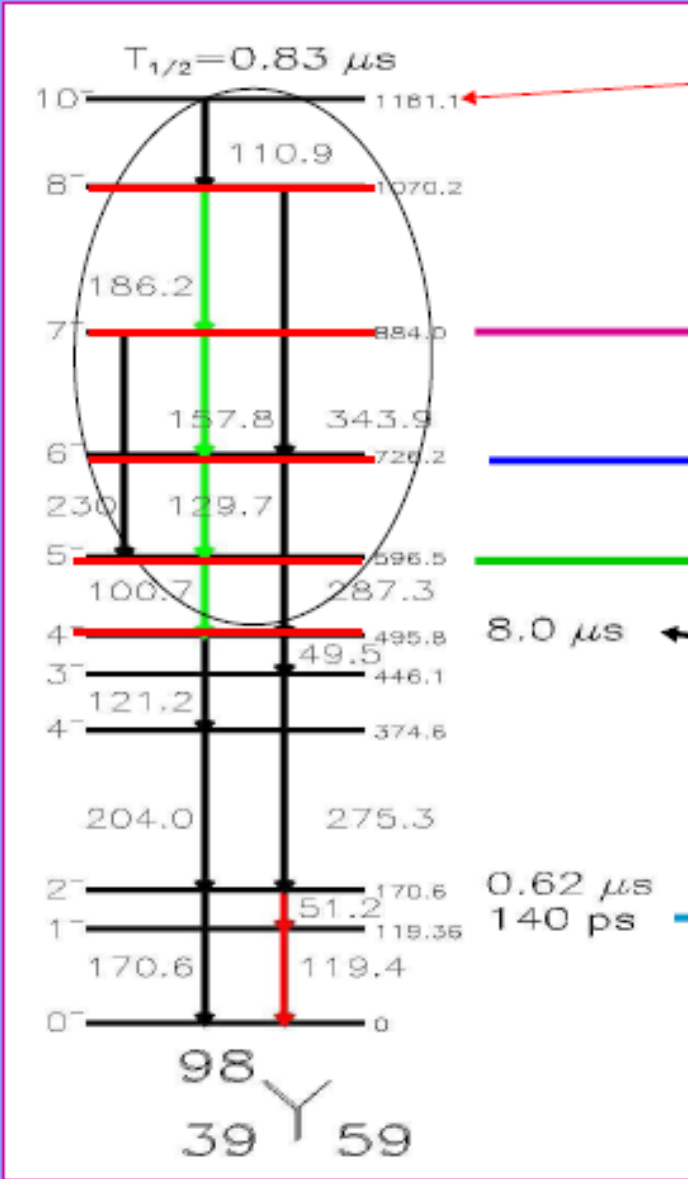
^{98}Y ion of interest



lifetime measurements



^{98}Y ion of interest



Preliminary Results

$$\pi(g_{9/2}) \quad v(h_{11/2})$$

Experiment

≤ 50 ps

≤ 70 ps

120 ± 20 ps

$\pi[422]5\lambda$

170 ± 20 ps

 ≥ 50 ps ≤ 70 ps 120 ± 20 ps $\pi[422]5/2 \vee [541]3/2$ $170 \pm 20 \text{ ps}$

Theory (*)

25 ps

56 ps

157 ps

41]3/2

$\epsilon_2 \sim 0.3$

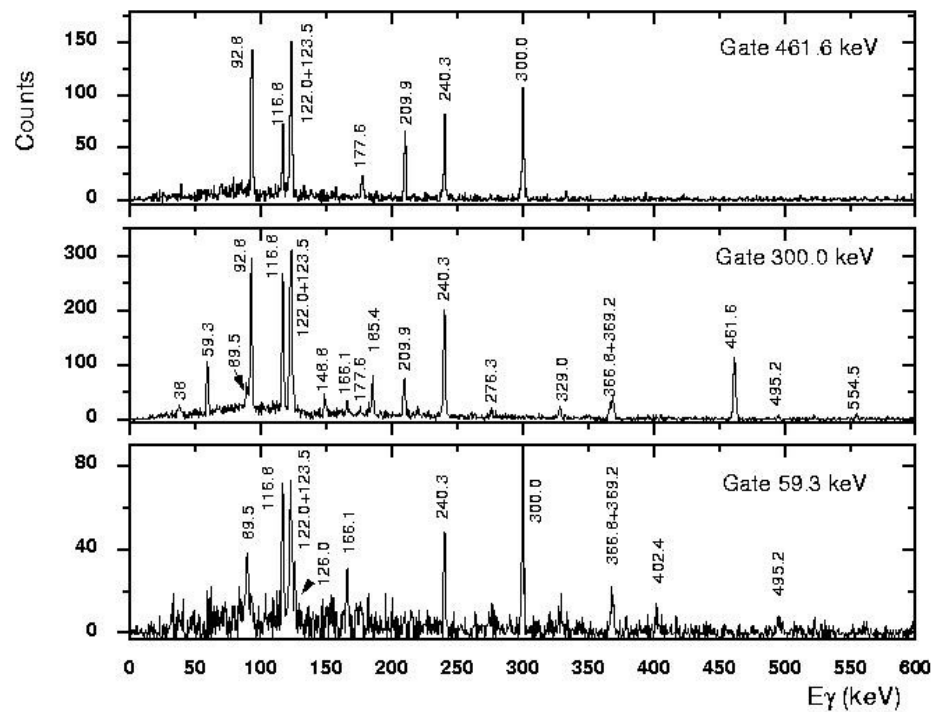
25 ps

56 ps

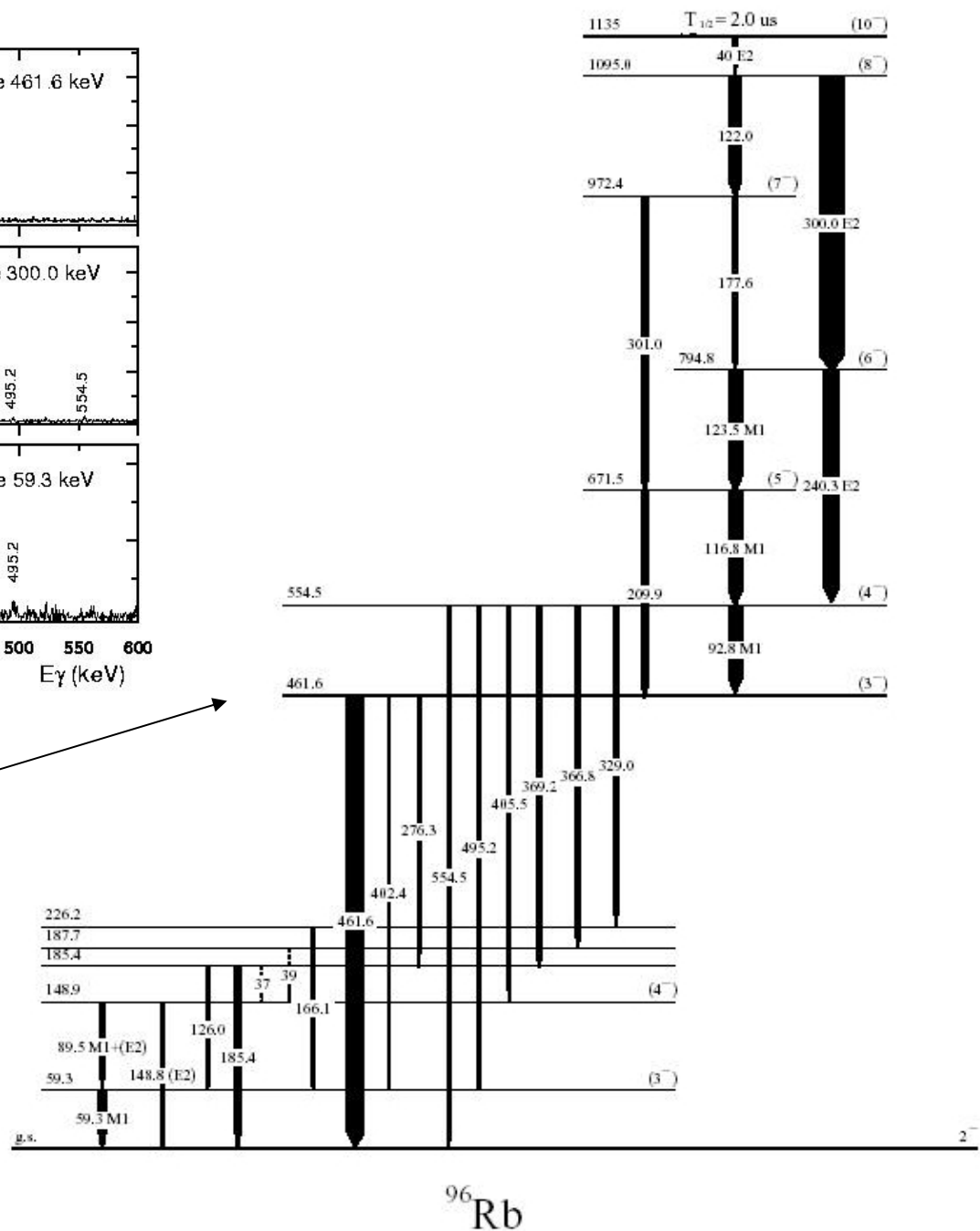
157 ps

$$\varepsilon_2 \sim 0.3$$

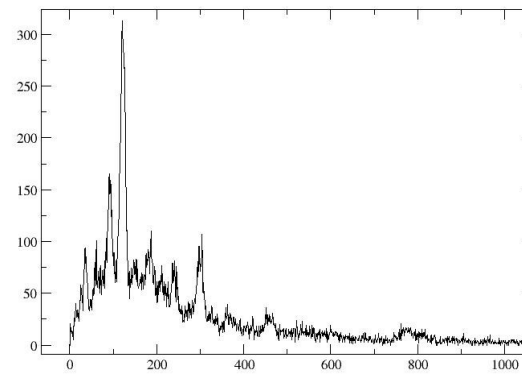
(*) Quasiparticle-rotor-model



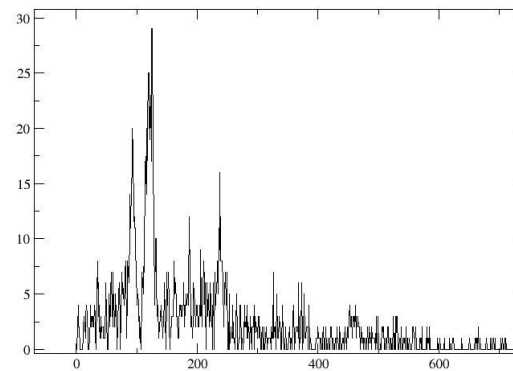
Deformed
 $\pi[3/2\ 431]\ \nu[3/2\ 541]$



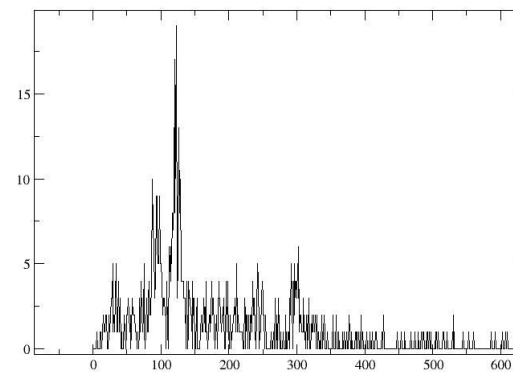
Total Projection

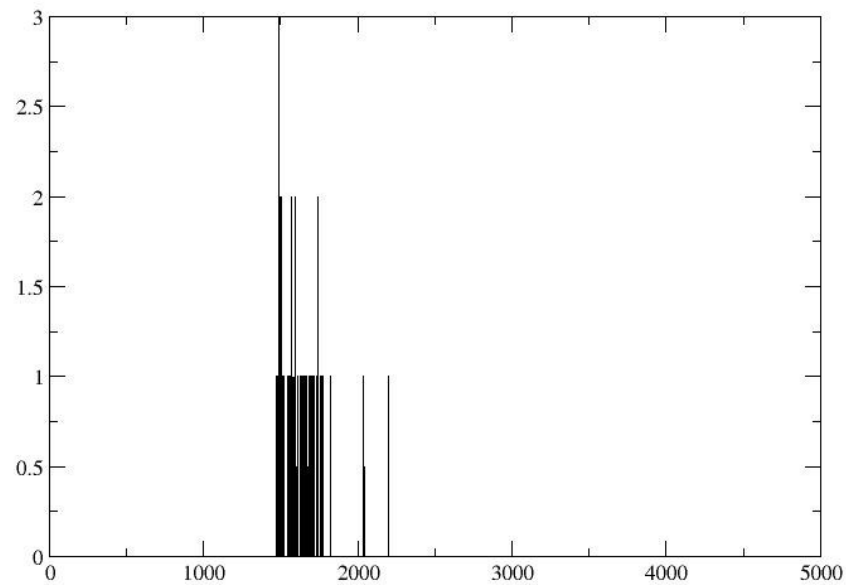


Gate 300 keV

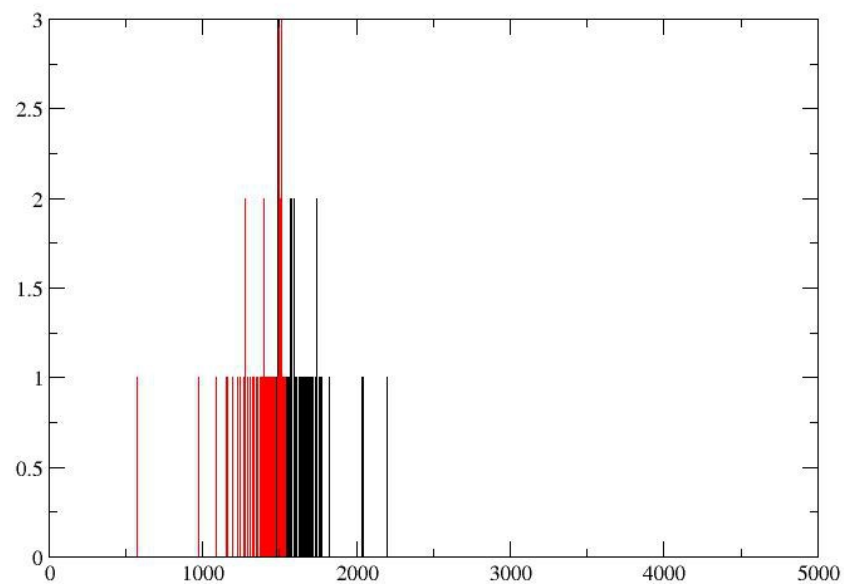


Gate 461 keV





Gate 300 keV + 461 keV



Gate 461 keV + 300 keV

$T_{1/2} \sim 3$ ns

Conclusions

Lifetimes of deformed intermediate-spin states have been measured for ^{98}Y ^{96}Rb

- Neutron-rich far from stability
- Odd-odd nuclei with complex decay schemes

Analysis is very difficult

- Need auto gain matching software
- many calibration sources (use activation at ILL)

Thanks to Henryk for many years of help