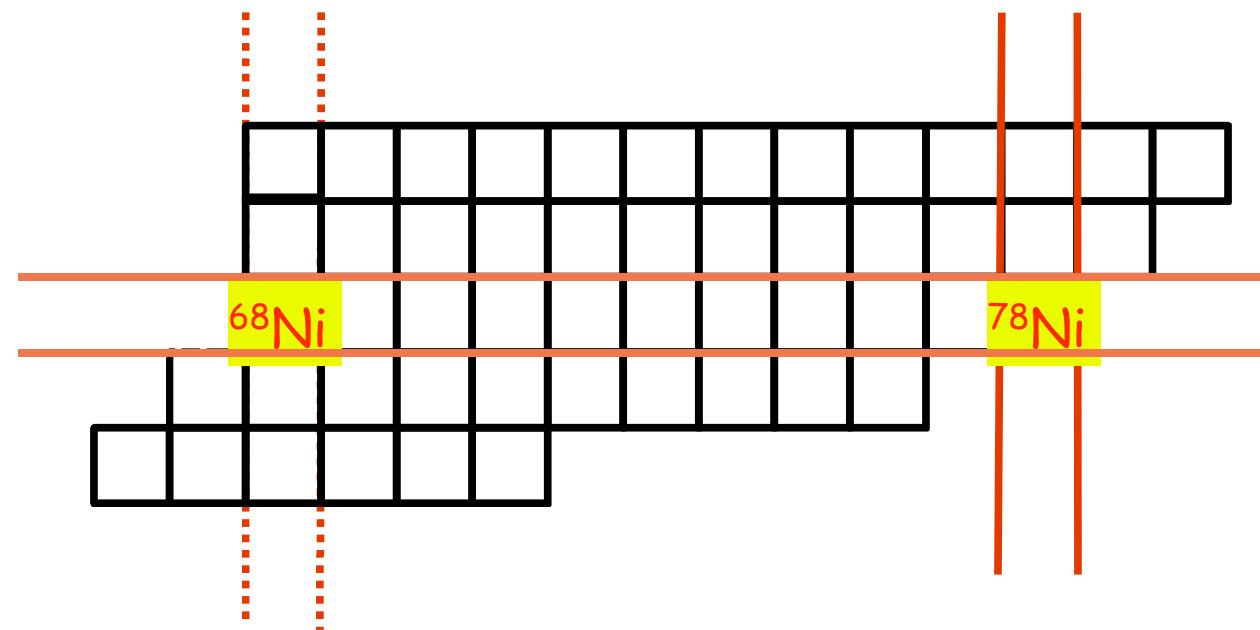


50

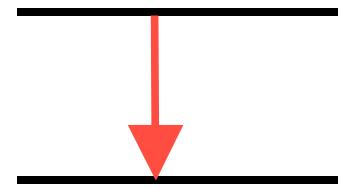
40

28

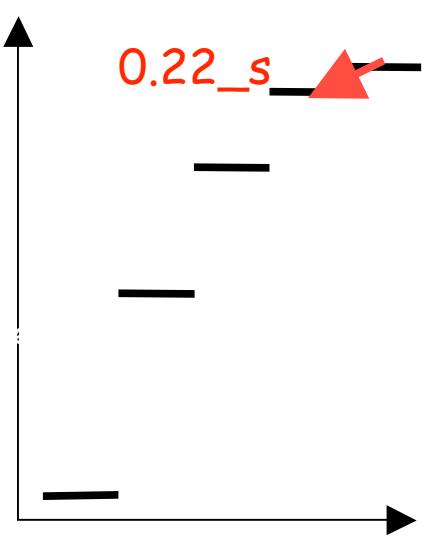
20



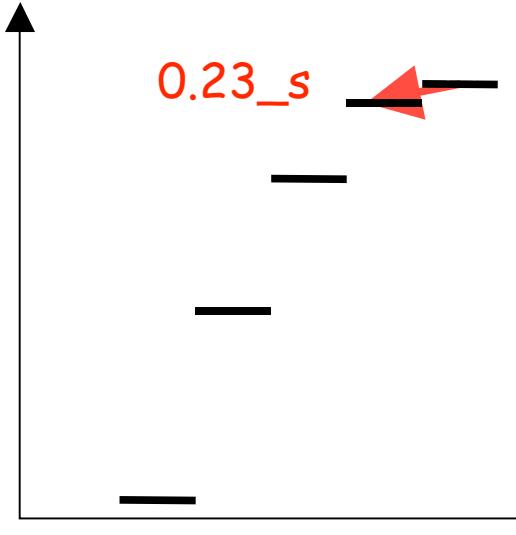
*large:*  $\frac{-J}{-E}$



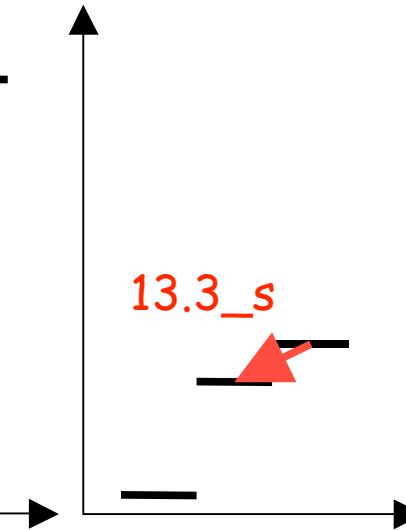
0.22\_s



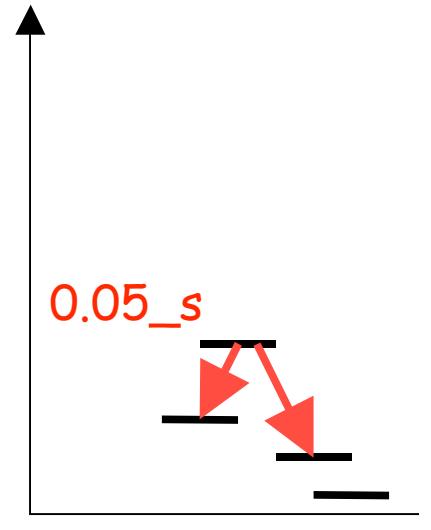
0.23\_s



13.3\_s



0.05\_s



Fragmentation of relativistic heavy ions

R. Grzywacz et al. Phys. Rev. Lett. 81, (1998) 766

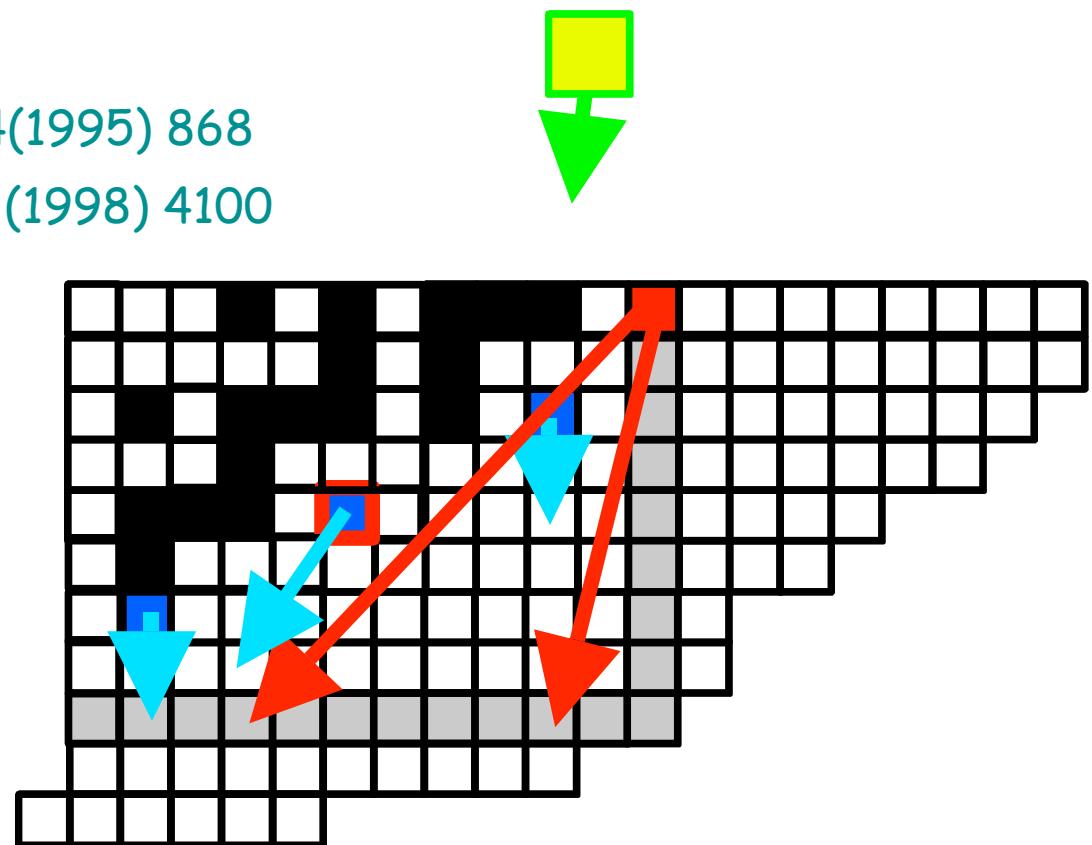
Fission of relativistic heavy ions

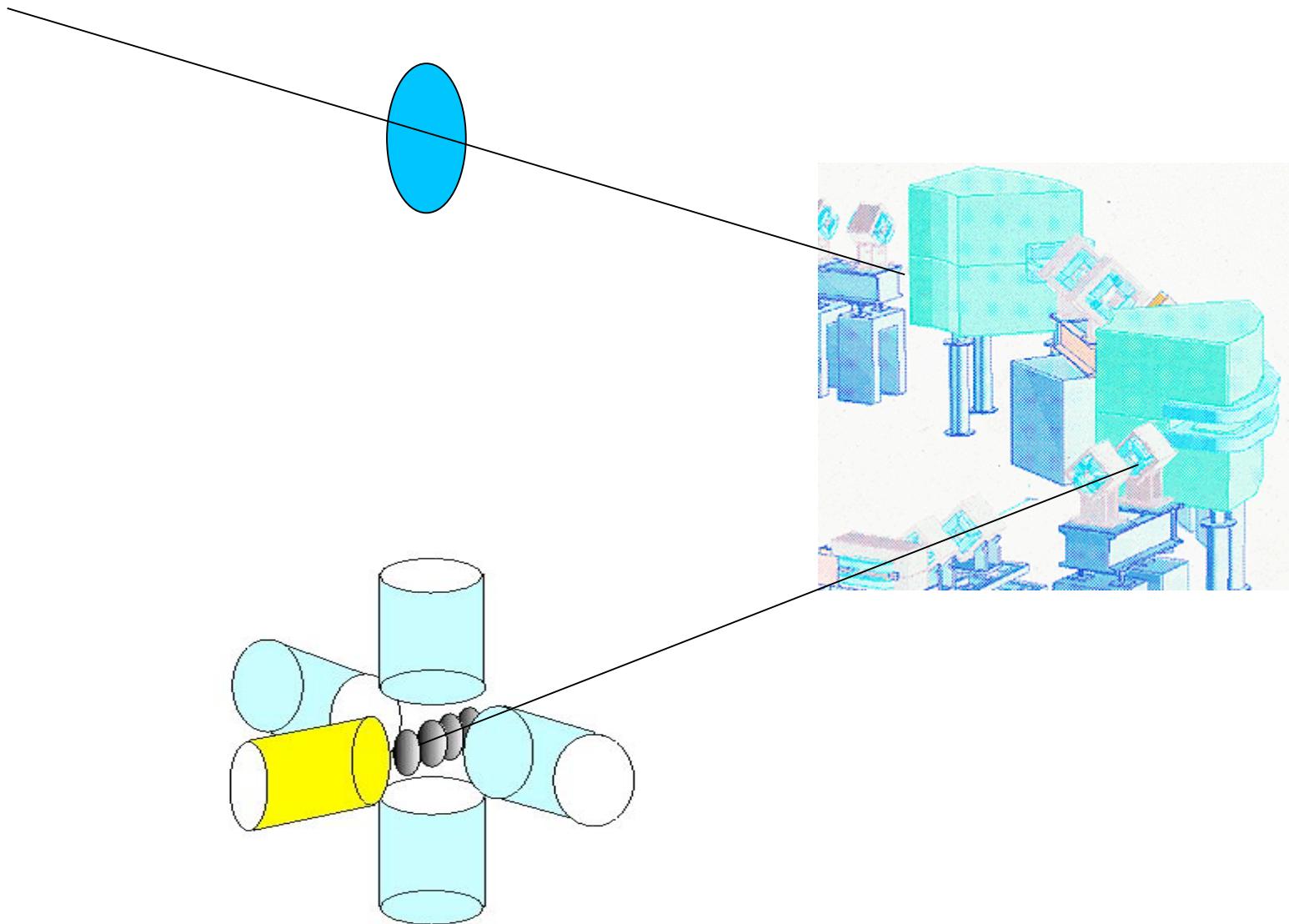
M. Pfützner et al. Nucl. Phys. A626 (1997) 259c

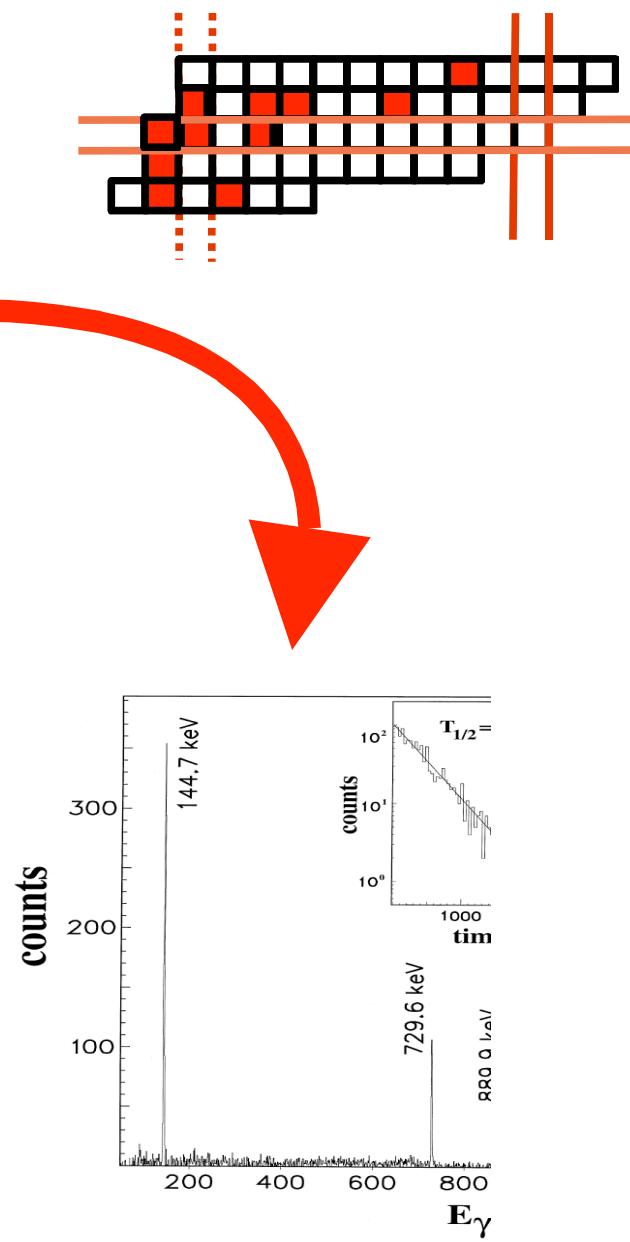
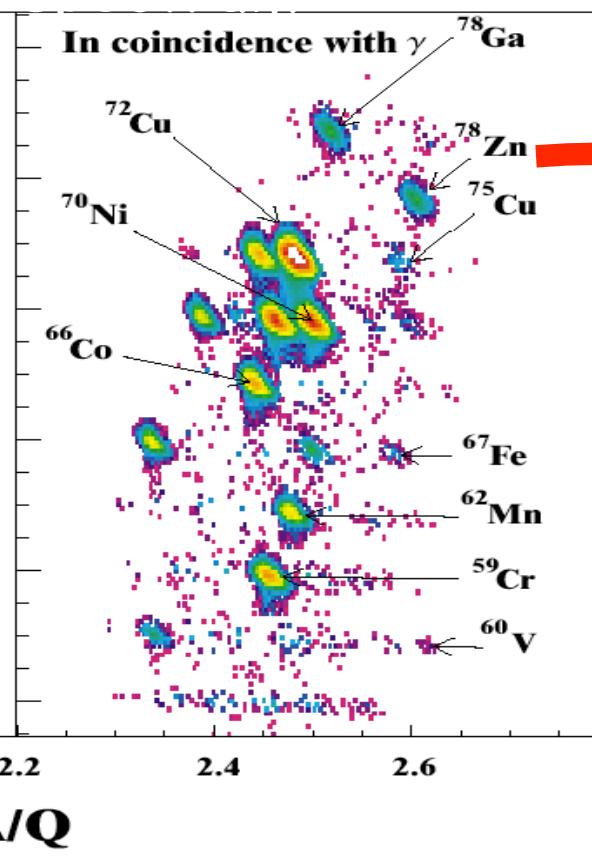
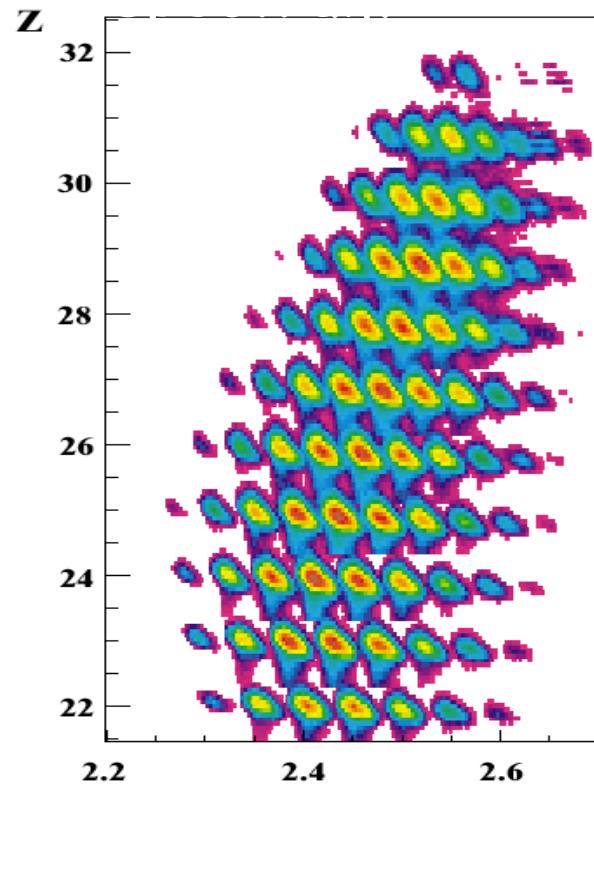
Deep inelastic collision

R. Broda et al. Phys. Rev. Lett. 74(1995) 868

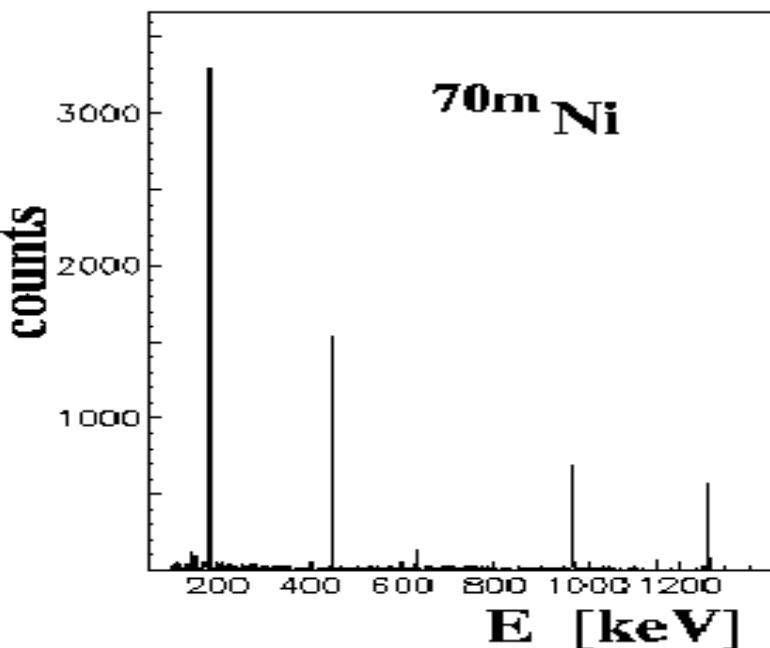
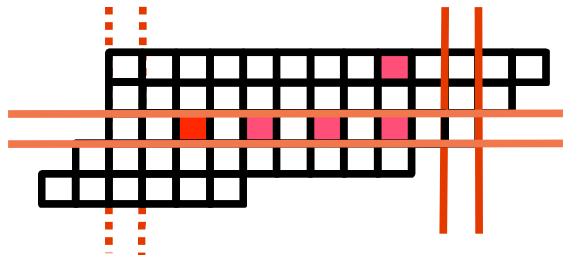
T. Ishii et al. Phys. Rev. Lett. 81 (1998) 4100







## Systematics of 8+ isomers at N=50 and Z=28



8+ isomers: $(g_{9/2})^2$				
N=50	protons			
8+ 190ns	71000ns	1810ns	200ns	60ns
6+	—	—	—	—
4+	—	—	—	—
2+	—	—	—	—
0+	Z=42 92Mo	Z=44	Z=46	Z=48 98Cd

Z=28	neutrons			
8+ 230ns	~300 ns	—	—	320ns
6+	—	—	—	—
4+	—	—	—	—
2+	—	MISSING 8+ ISOMERS	—	—
0+	N=42 70Ni	N=44	N=46	N=48 76Ni

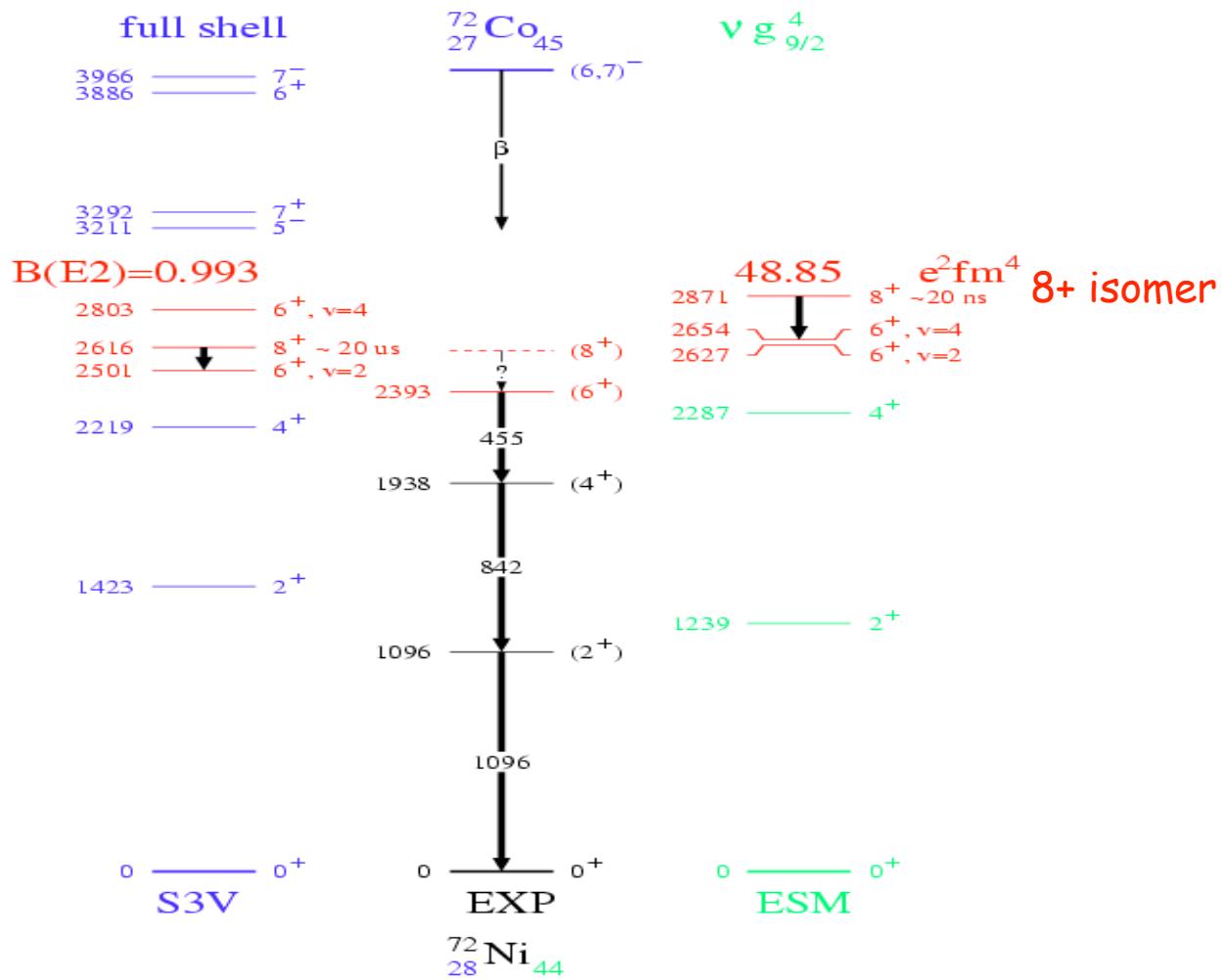
### 8+ isomers in $^{72,74}\text{Ni}$

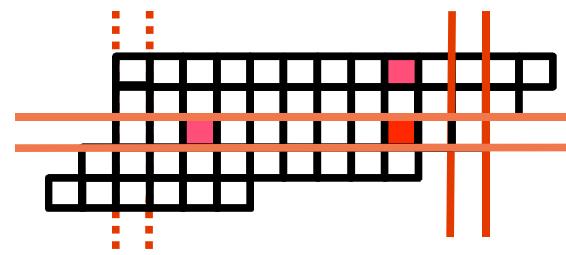
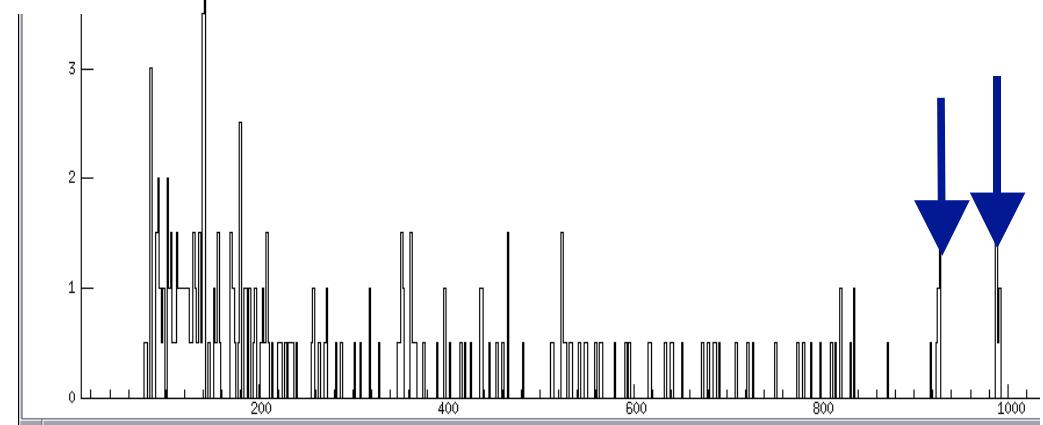
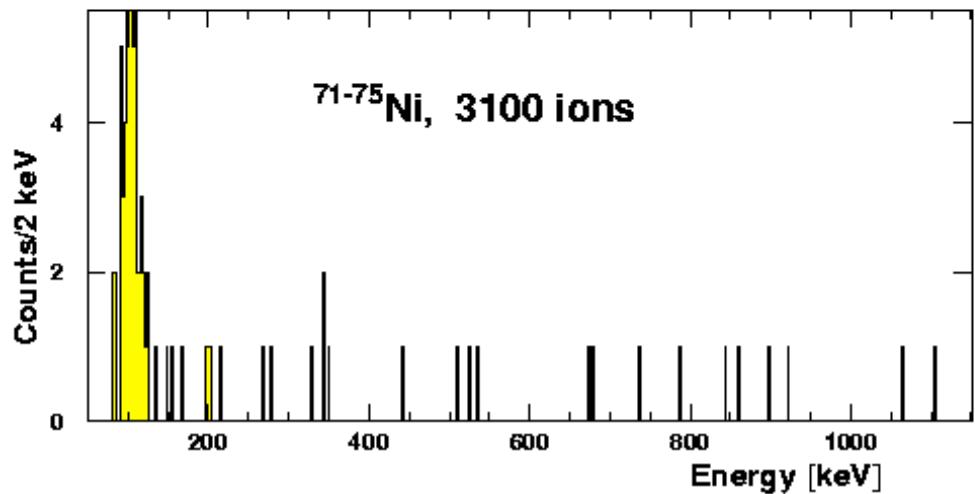
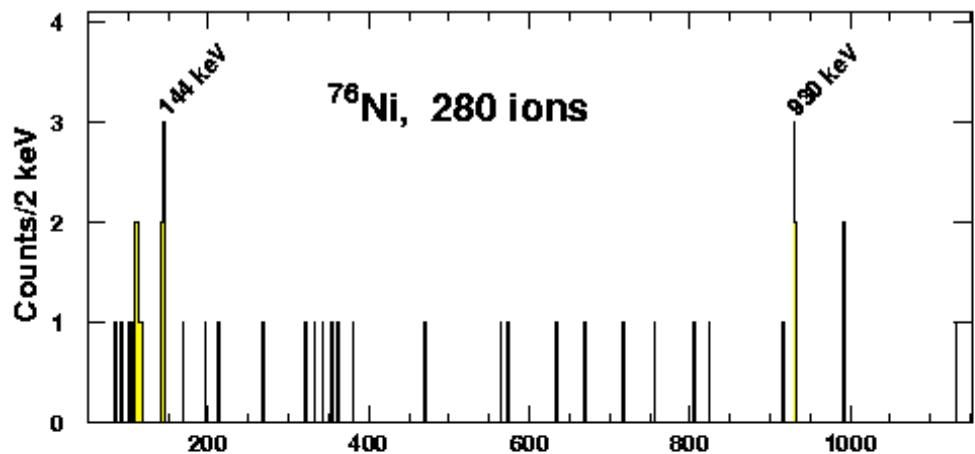
- expected from the systematics
- predicted by the SM-calculations
- but not observed experimentally !!!

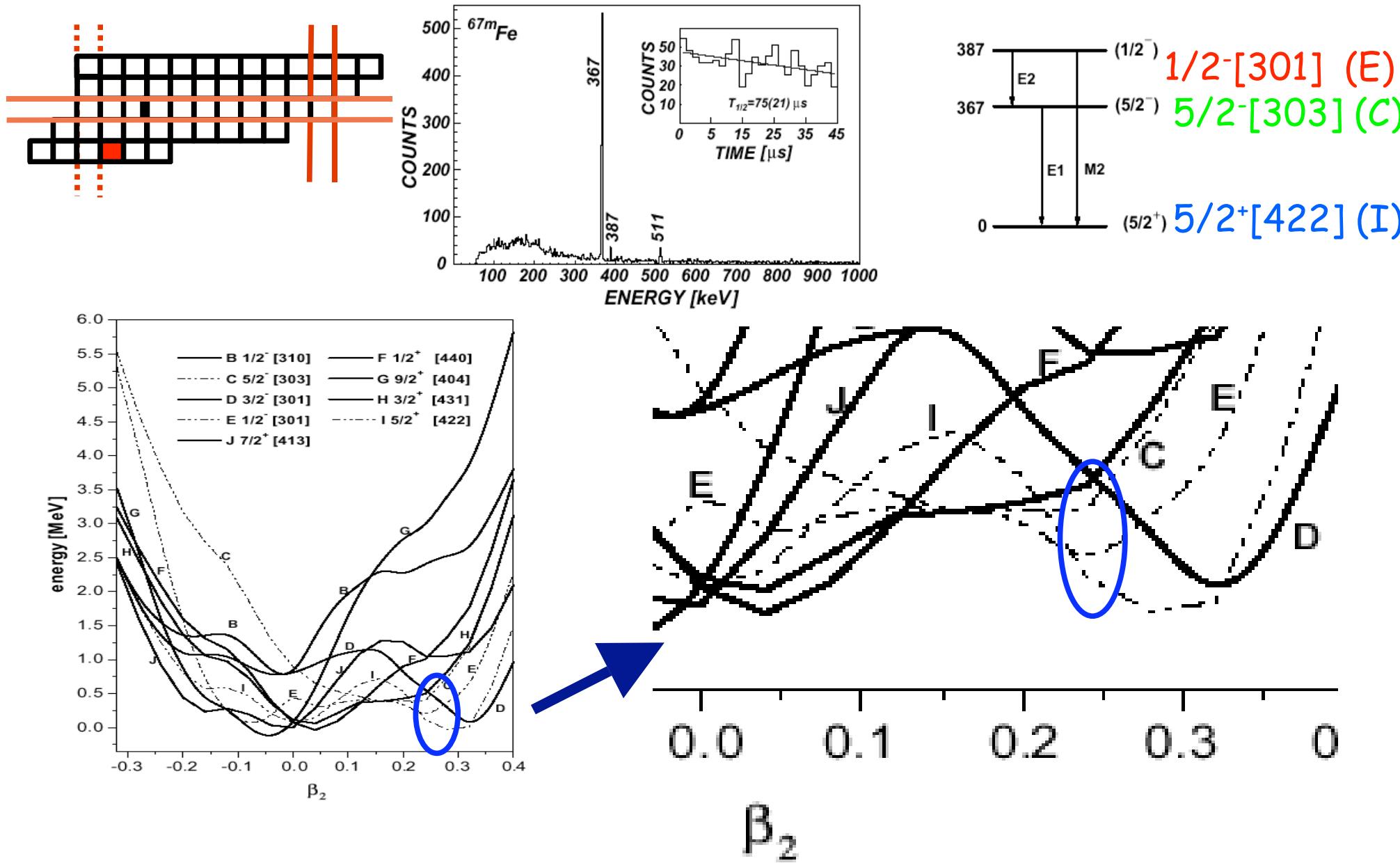
R. Grzywacz et al. Conf. on Fission and Neutron-rich Nuclei St. Andrews 1999

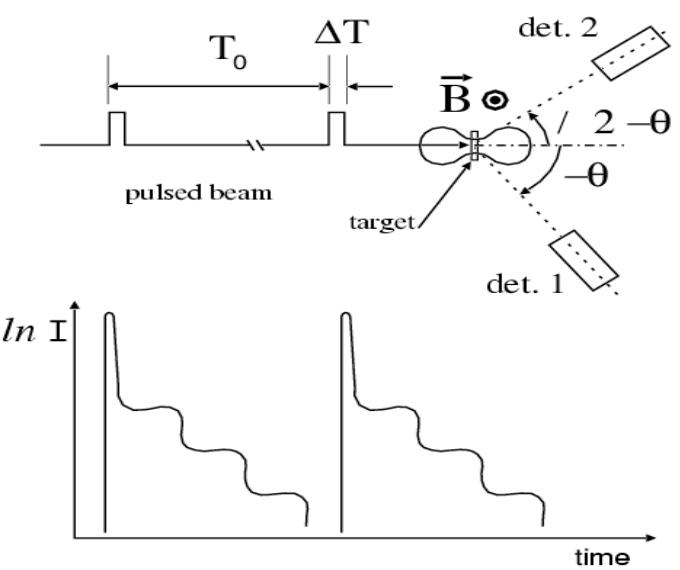
## Missing $I^\pi=8^+$ isomer

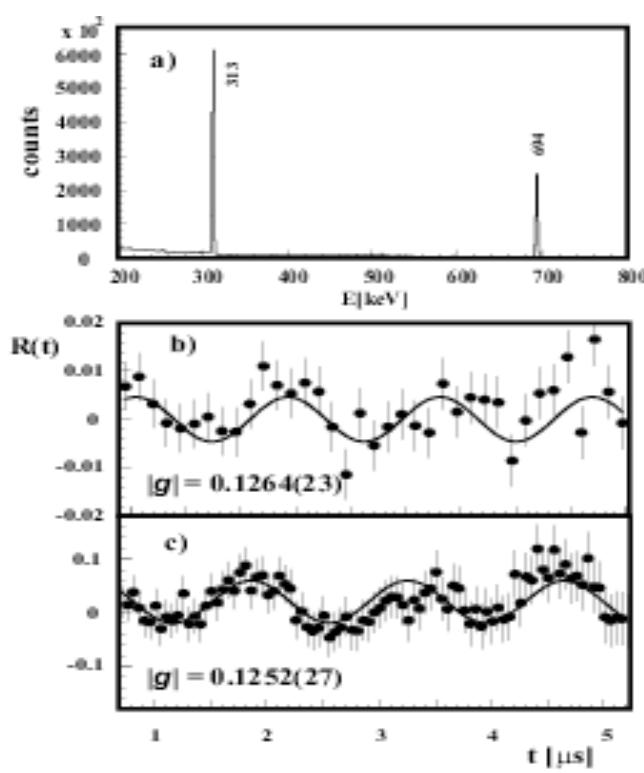
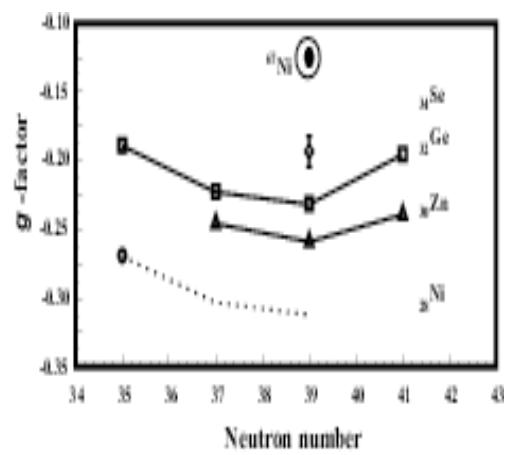
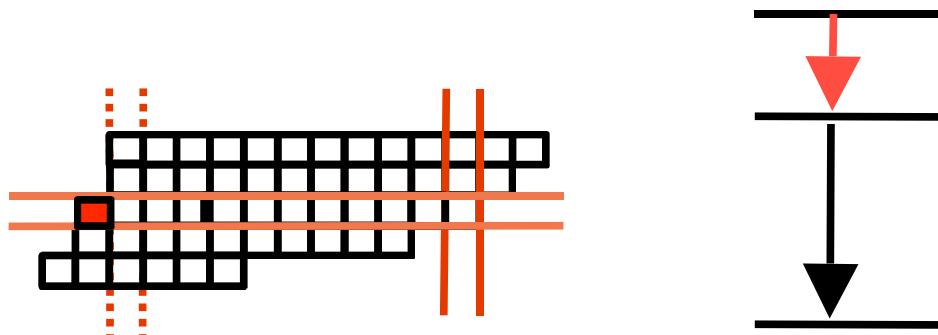
8+ isomer

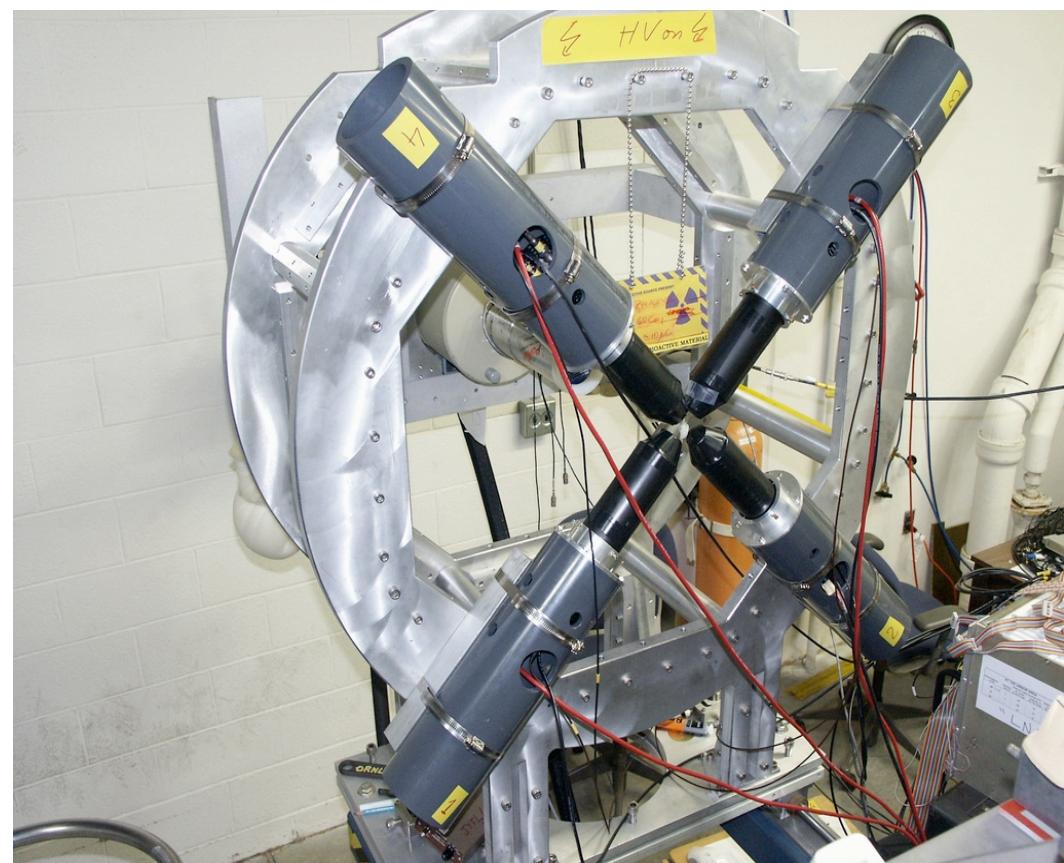
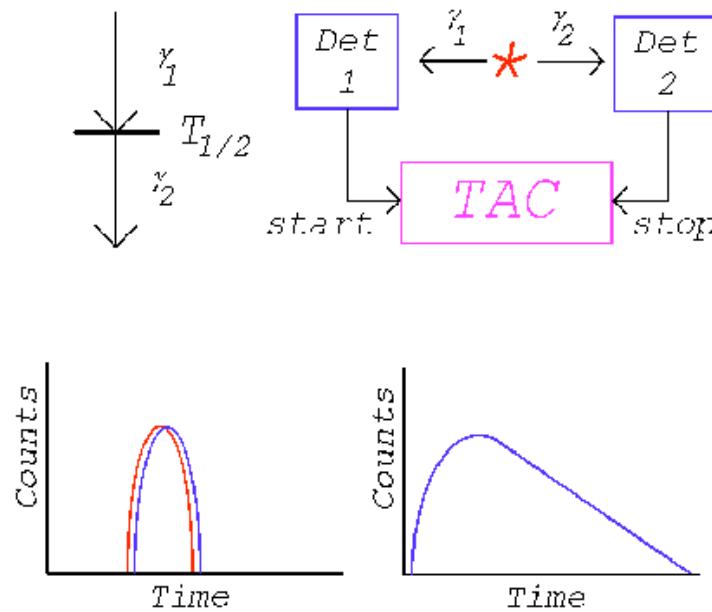


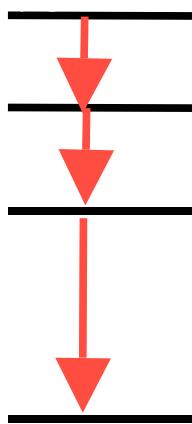
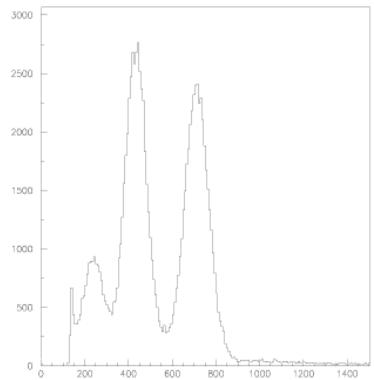
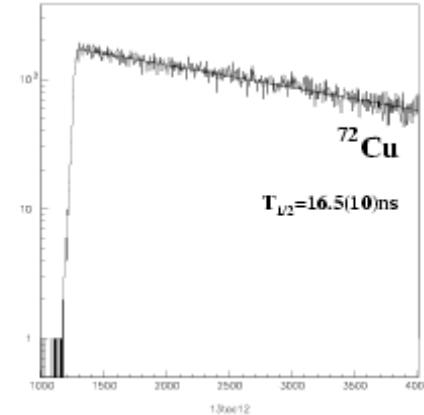
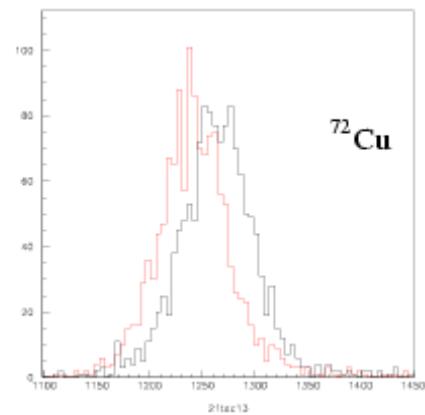
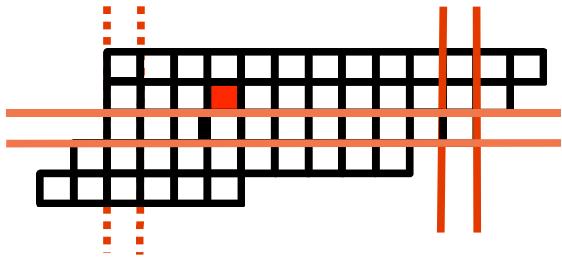












## Nanosecond isomers

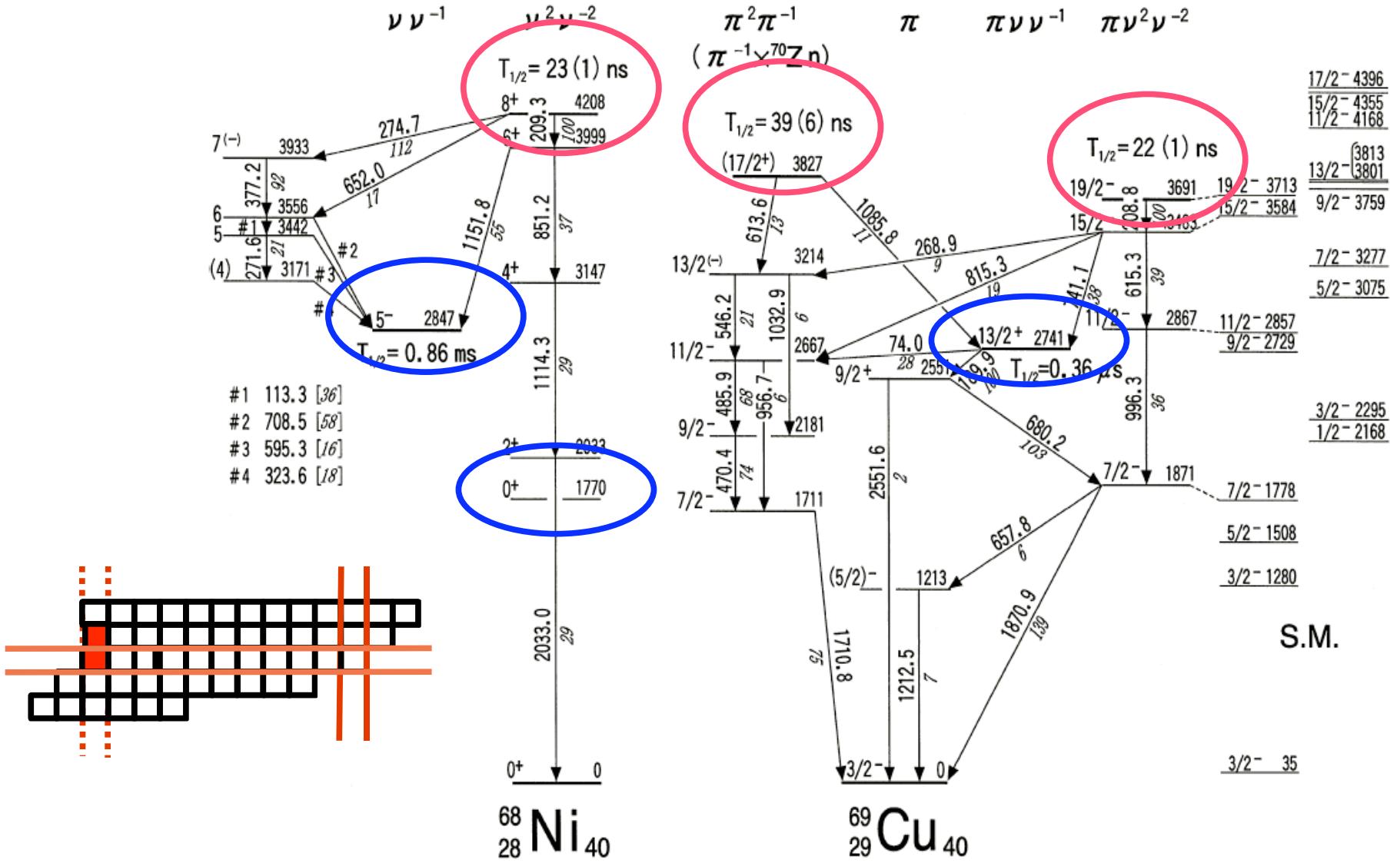
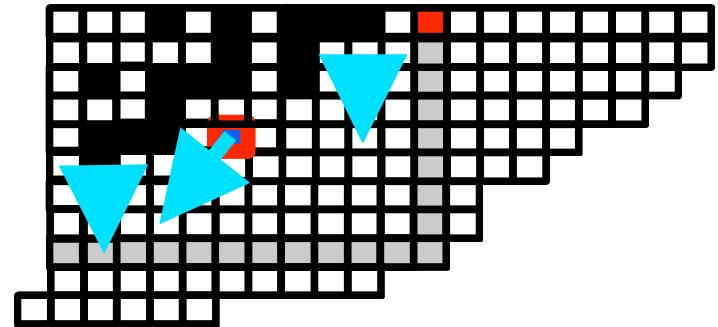


FIG. 3. Decay schemes of the isomers in  $^{68}\text{Ni}$  and  $^{69}\text{Cu}$ . The relative  $\gamma$ -ray intensities are depicted in italics. The experimental levels in  $^{69}\text{Cu}$  denoted by  $\pi\nu^2\nu^{-2}$  are compared to the shell model calculation (see text); the calculated yrast levels are shown next to the experimental ones.

## Isomers from fragmentation studies:

- increase detection sensitivity ( $4\pi$  detection)
- increase  $^{86}\text{Kr}$  beam intensities
- decrease TOF
- secondary fragmentation



DIC - Isomer Scope with  
postaccelerated radioactive ion beams !  
(see W. Królas presentation )

Coulomb excitation of relativistic radioactive ion beam

beta-decay of fragmentation/fission products

- magicity of the  $^{78}\text{Ni}$  is preserved ( $^{78\text{m}}\text{Zn}, ^{76\text{m}}\text{Ni}$ )
- evidence for deformation  $Z<28$  ( $^{67\text{m}}\text{Fe}, ^{66}\text{Fe}$ )
- residual interactions needs to be revisited ( $^{72???\text{m}}\text{Ni}$ )
- evidence  $Z=28$  core breaking ( $^{67\text{m}}\text{Ni}$ )
- disappearance of  $N=40$  shell-closure for  $Z<28$
- monopole migration ( $^{69}\text{Cu}, ^{71}\text{Cu}, ^{73}\text{Cu}$ )