

FAIR electromagnetic moments

Table 1: Experimental opportunities for high-resolution spectroscopy at the low-energy branch.

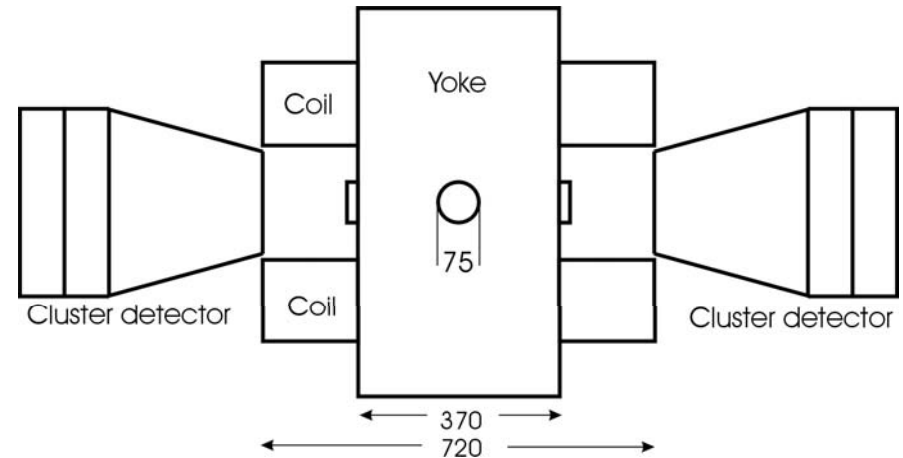
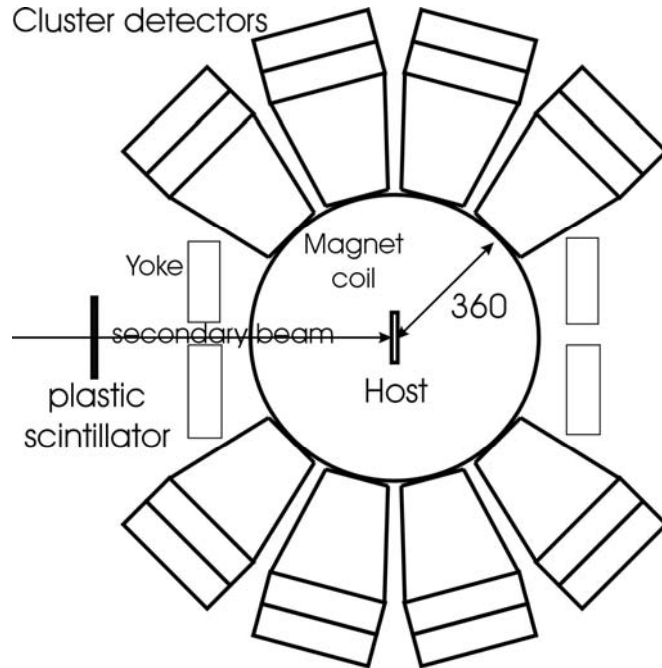
Research field	Experimental method (beam-energy range)	Physics goals and observables	Beam int. (particle/s)
Nuclear structure, reactions and astrophysics	Intermediate energy Coulomb excitation, In-beam spectroscopy of fragmentation products (E/A ~ 100 MeV)	Medium spin structure, Evolution of shell structure and nuclear shapes, transition probabilities, <u>moments</u> ,	$10^1 \dots 10^5$

Worldwide experience for isomeric electromagnetic moments with fast beams

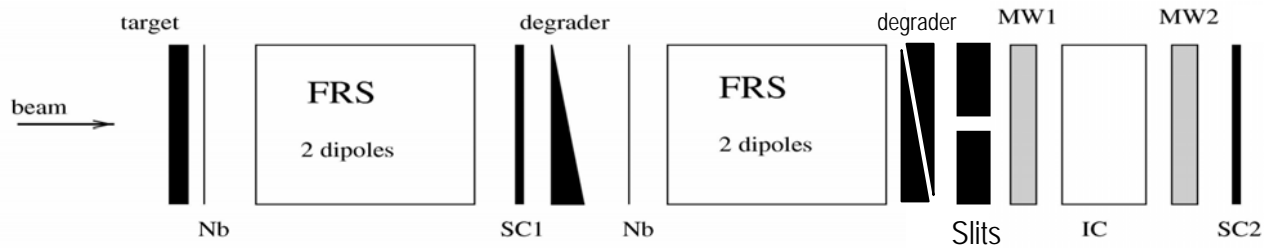
- two g-factor experiments @ GANIL (~ 50 -70 MeV/u) in 1999 and 2003
G. Georgiev et al., JP G 28 (2002) 2993 , I. Matea et al., PRL 93, 142503 (2004)
- one g-factor experiment @ MSU (~ 170 MeV/u) in May 2005
- one g-factor experiment @ GSI (~ 250 MeV/u) in 1993
W.D. Schmidt-Ott et al., Z. Phys. A 350 (1994) 215
- three g-factor experiments @ GSI (scheduled for Nov.-Dec. 2005)
- one Q-moment experiment @ GANIL (scheduled for July 2005)
- one Letter of Intent @ GSI (proposal to be submitted Sept. 2005)

The GSI set up

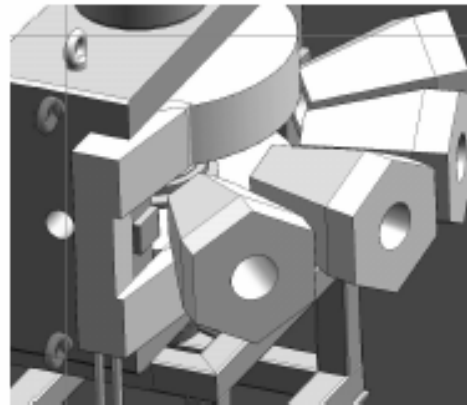
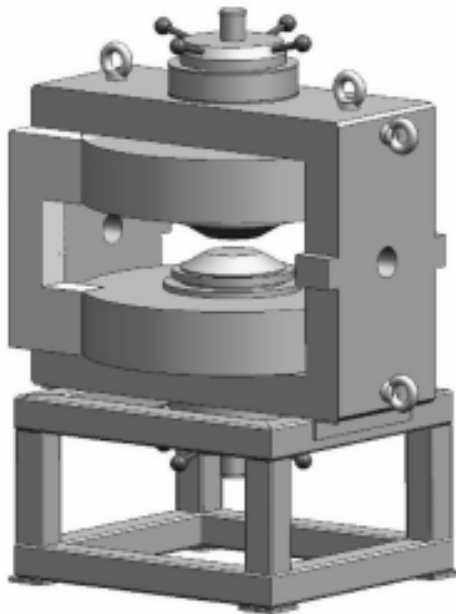
- the isomers should be produced fully stripped and remain stripped until implantation
- the γ -decay occurs preferentially via a transition of pure multipolarity (if mixed, a larger or lower anisotropy parameter is possible).
- the γ -energy of at least one transition in the cascade is higher than 300 keV
- the isomeric lifetime is between 300 ns and a 30 ms.



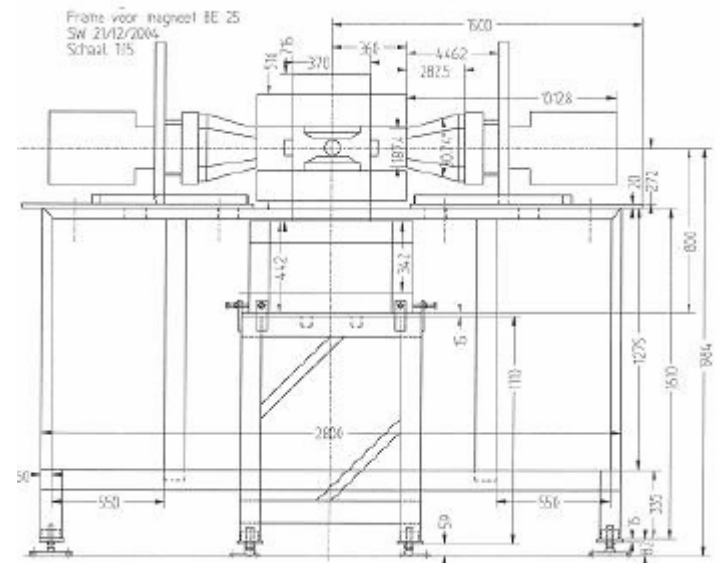
$$N(t, \theta, \omega_L) = e^{-t/\tau} W(t, \theta, \omega_L)$$



NB! Need to know and take into account all materials on the way of the beam.

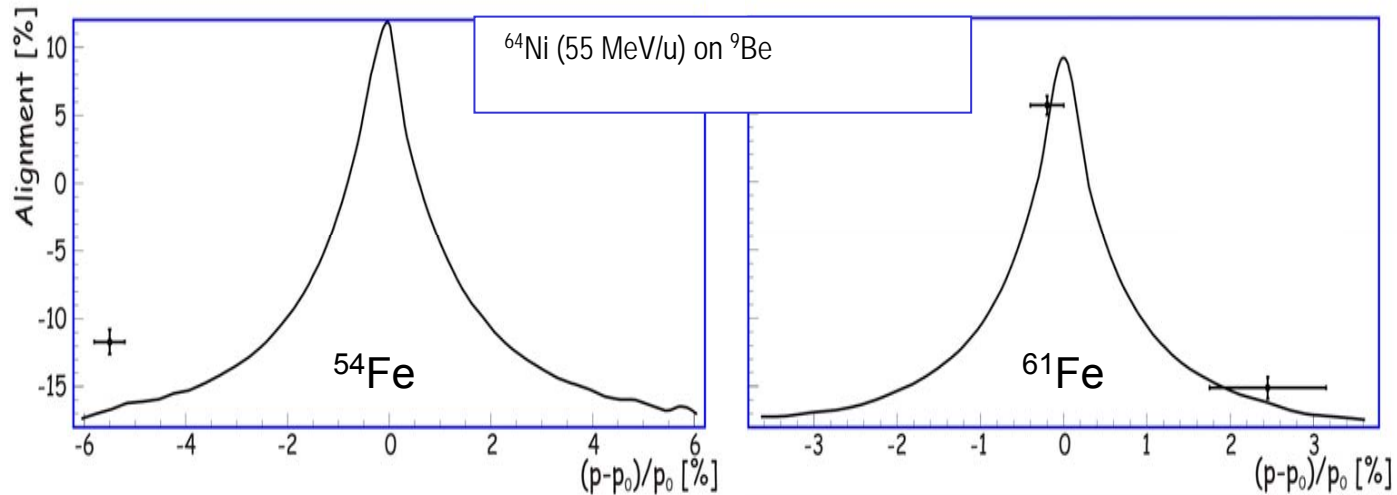


Need to take into account the precise orientation of each Cluster crystal and perform realistic GEANT calculations in each case.



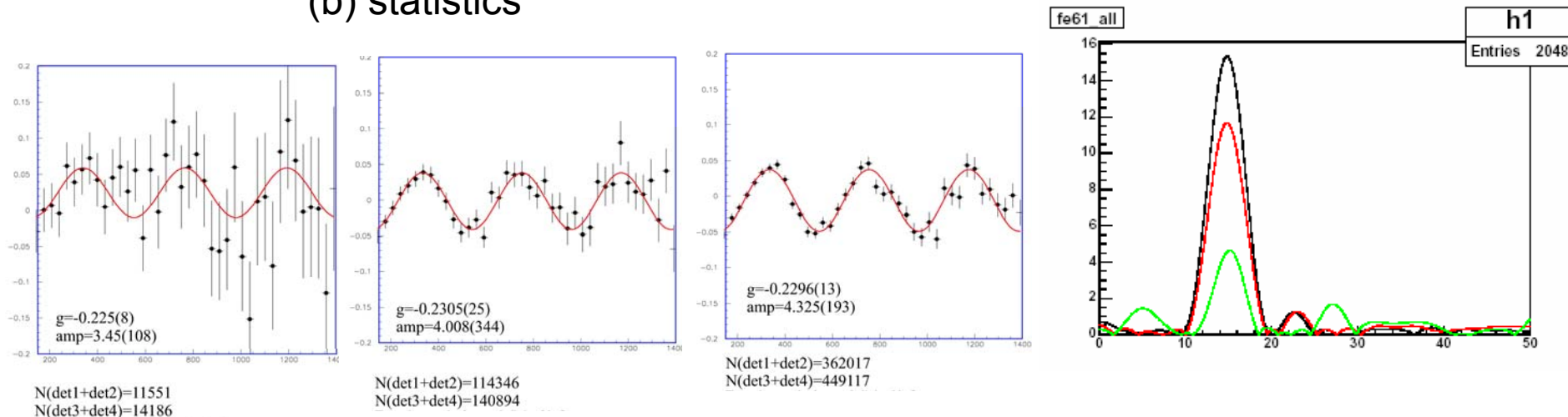
Problems

(a) alignment



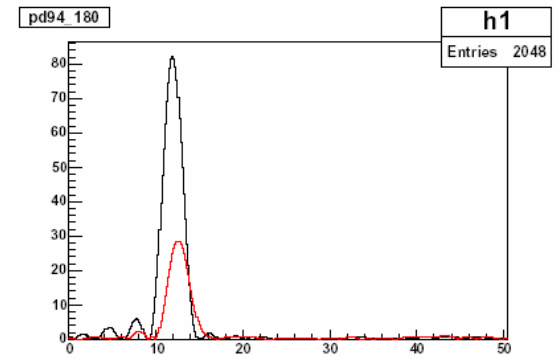
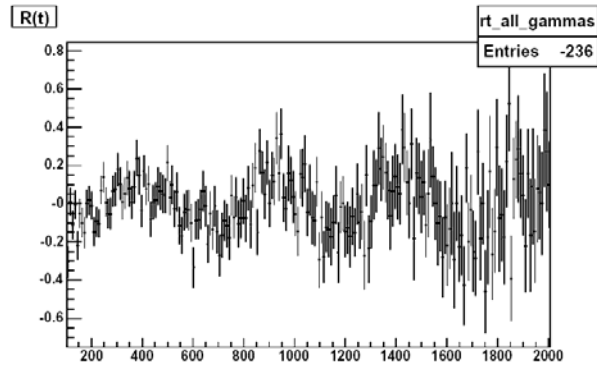
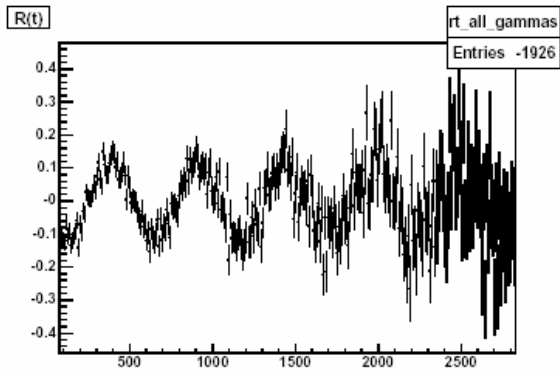
NB ! In this experiment a thin Be production target has been used. The effect of the target thickness need to be taken into account in each particular case.

(b) statistics



Realistic simulations: ^{94}Pd @ GSI

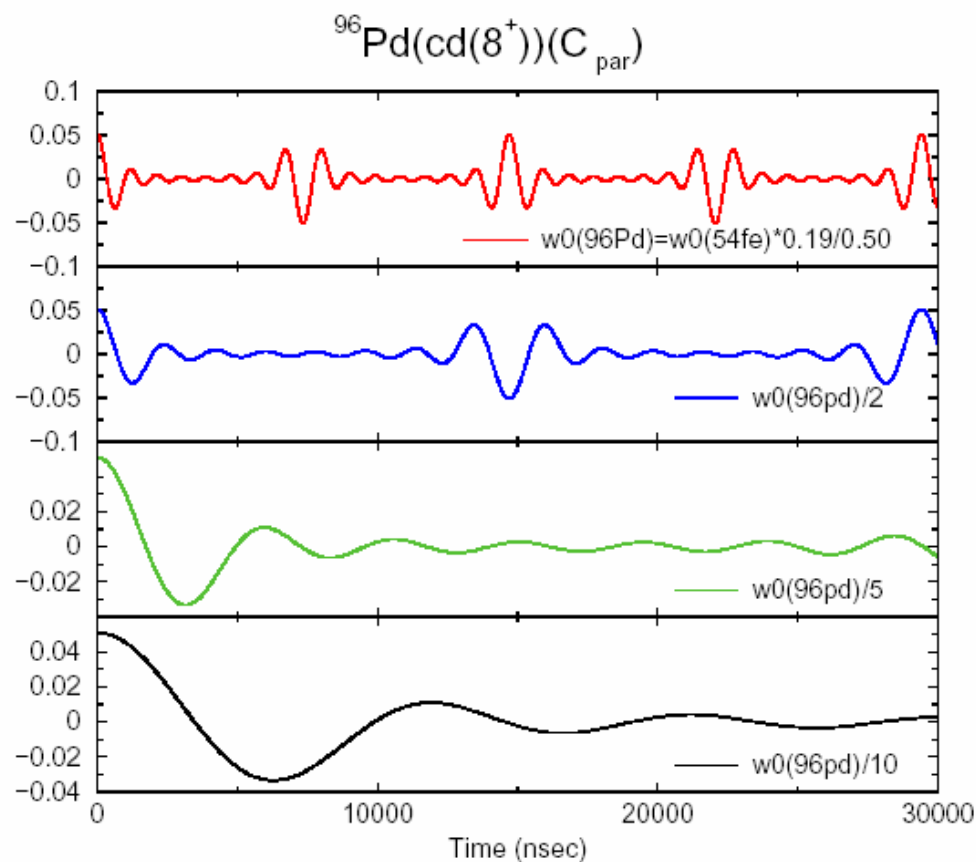
if we have $N_\gamma \approx 400$ γ /shift
is the experiment doable ?



NB ! More realistic simulations are needed, taking into account the correct positions of the Cluster crystals, as well as the background.

What about quadrupole moments?

- experienced people tell that a quadrupole moment measurement is an order of magnitude more difficult than a g-factor measurement
- we are going to obtain this experience in the next months



FAIR electromagnetic moments WG

The electromagnetic moments community in Europe gains experience and has some work to do till the end of the year. After the g-RISING campaign we will be ready to approach the HISPEC/DESPEC project.

What are the steps:

- realistic bremsstrahlung simulations (Pavel Detistov)
- realistic g-RISING simulations including Clusters (Pavel Detistov, Georgi Georgiev)
- the Q-RISING proposal (Lilia Atanasova)
- the g-RISING experiments;
- the Q-RISING experiment (eventually!);
- realistic bremsstrahlung simulations for AGATA modules and the demonstrator (Pavel Detistov)
- AGATA electromagnetic moments simulations (Pavel Detistov)

- other topics include
 - ground-state moments (β - and γ -NMR and LMR)
 - new magnet set up
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