NEW RESULTS ON NUCLEAR DISSIPATION AT SMALL DEFORMATIONS

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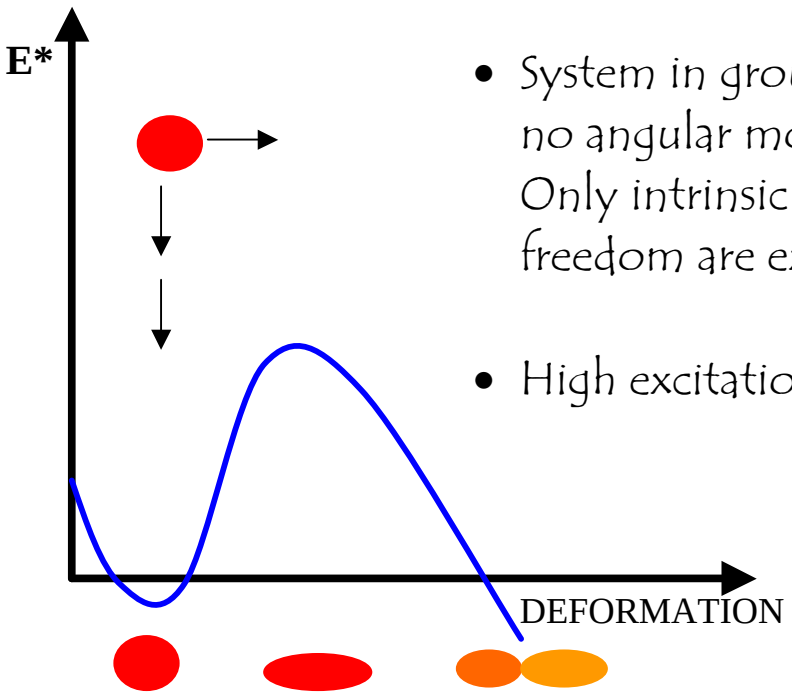
Introduction

- What is dissipation?
  Quantified by b, reduced dissipation coefficient

$$E_{col} = E_{col}^{eq}\left[1-\exp(-bt)\right]$$

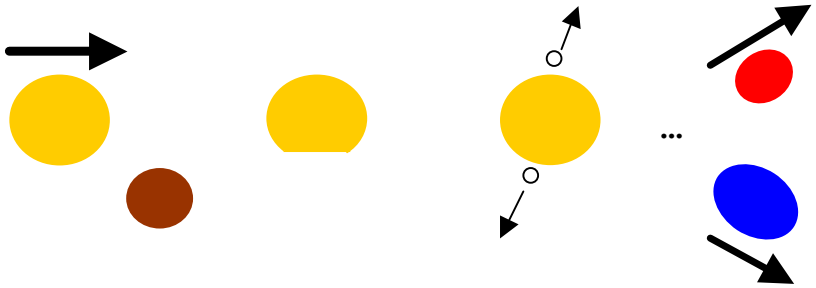
- Fission is an appropriate tool to investigate dissipation
- No clear experimental signatures of dissipation at small deformations

Ideal scenario



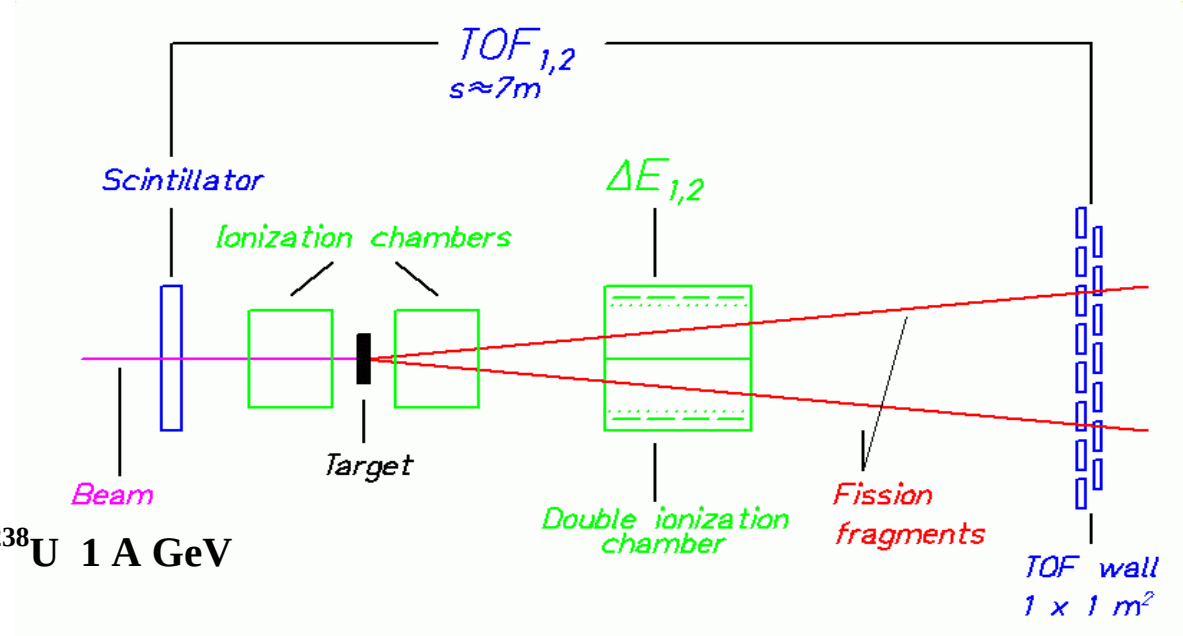
- System in ground state, no angular momentum. Only intrinsic degrees of freedom are excited
- High excitation energies

Fission induced by peripheral heavy-ion collisions at relativistic energies



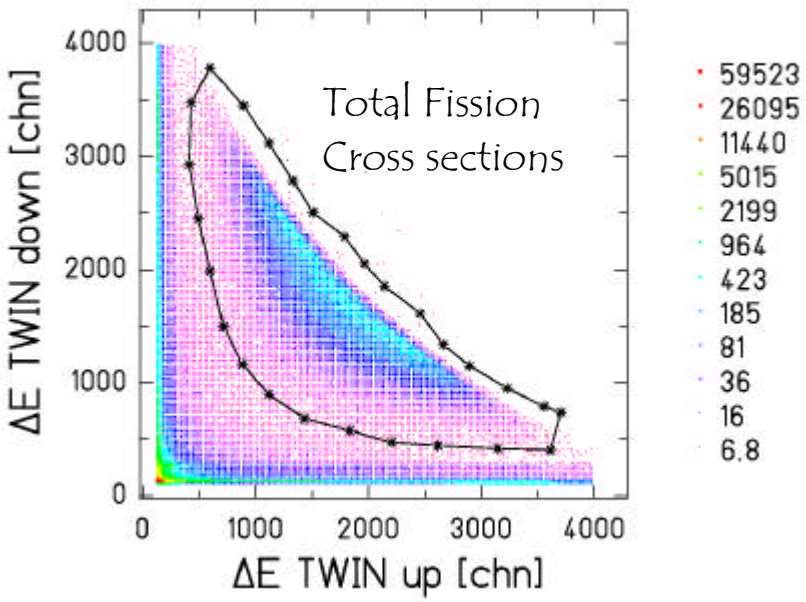
- Small shape distortion
- Low angular momentum
- High intrinsic excitation energies
- Inverse kinematics

Fission of ^{238}U at 1 A GeV on different targets



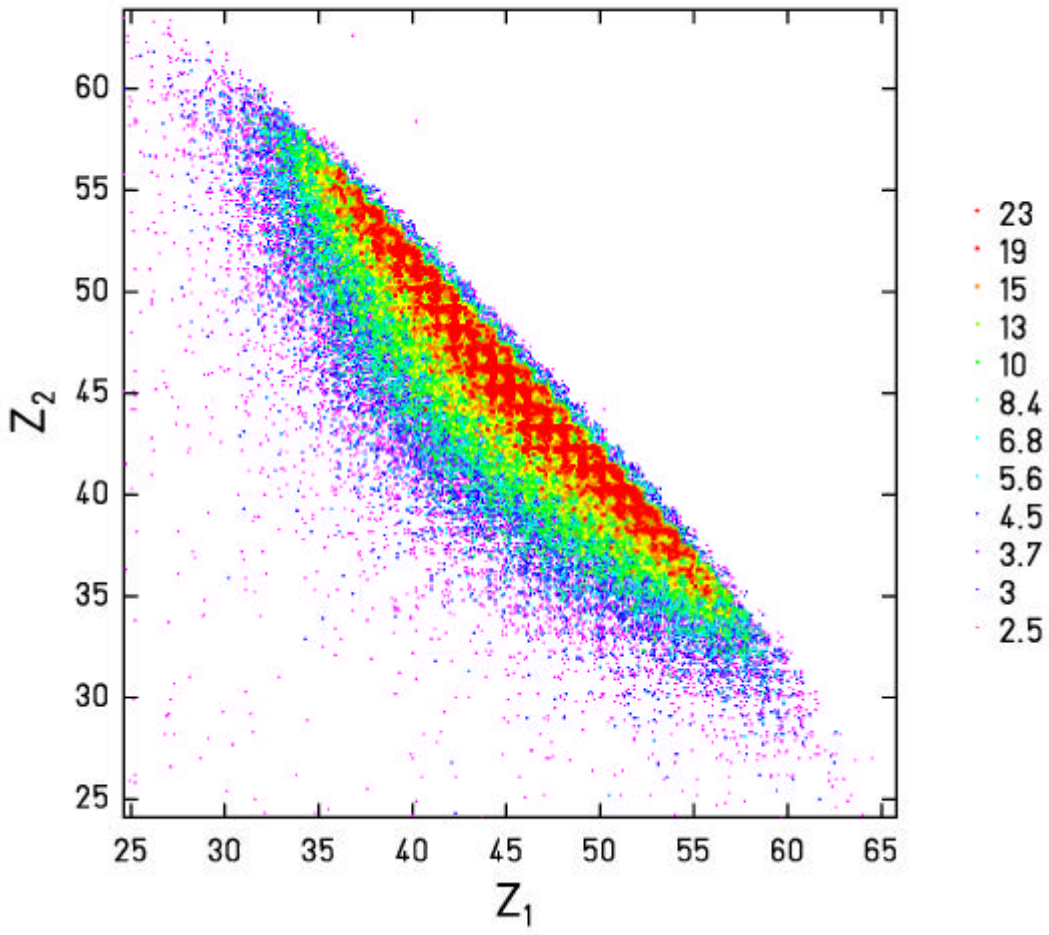
95% of detection efficiency

^{238}U (1 A GeV) + $(CH_2)_n$



New observables !!!

^{238}U (1 A GeV) + $(CH_2)_n$

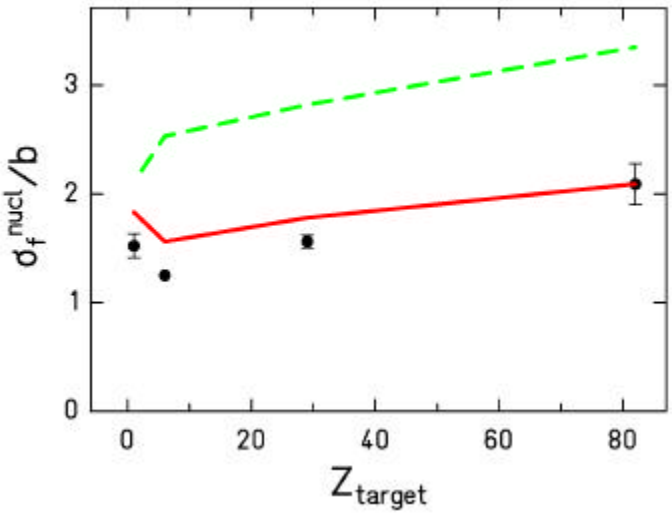


Partial fission cross sections $\sigma_{fiss}(Z_1 + Z_2)$

Width of the charge distributions of the fission fragments

Total fission cross sections

^{238}U (1 A GeV) on different targets

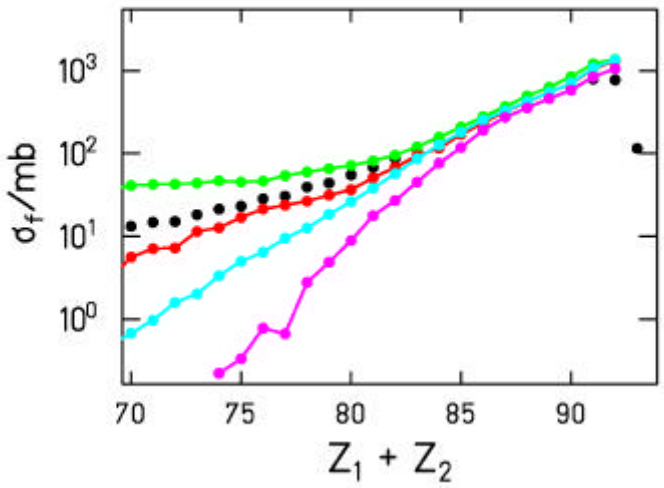


Experimental Data
No dissipation
b=2x10^{21}s^{-1}

The right trend of the target dependence is only reproduced when dissipation is considered

Partial Fission Cross Sections

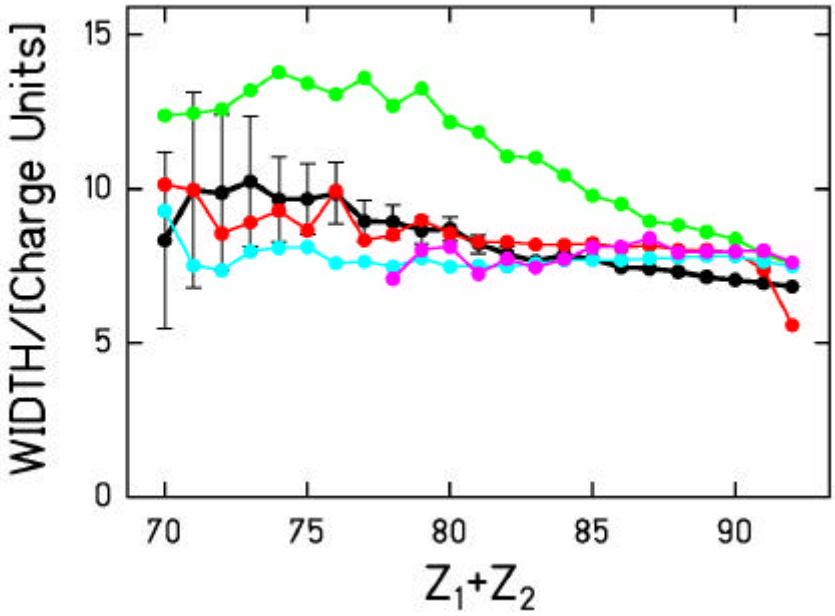
^{238}U (1 A GeV) + $(CH_2)_n$



Experimental Data
No dissipation
b=2x10^{21}s^{-1}
b=0.5x10^{21}s^{-1}
b=5x10^{21}s^{-1}

Widths of the charge distributions of the fission fragments

^{238}U (1 A GeV) + $(CH_2)_n$



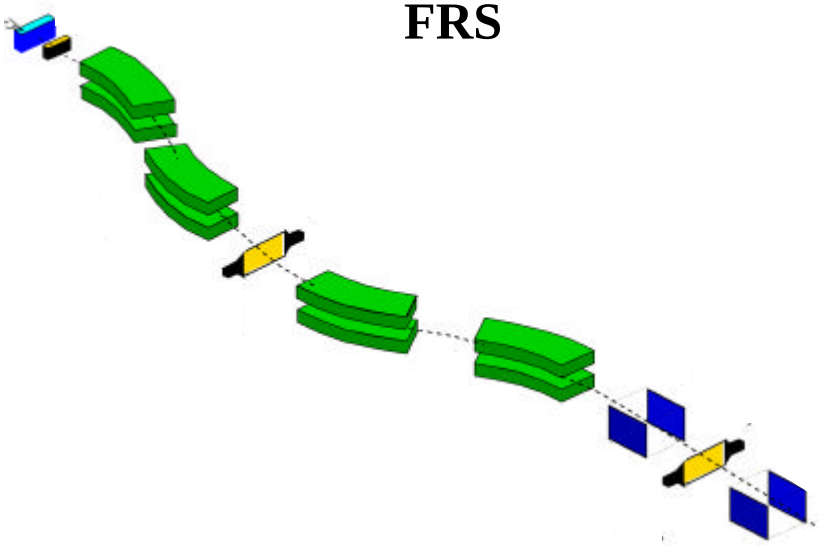
Experimental Data
No dissipation
b=2x10^{21}s^{-1}
b=0.5x10^{21}s^{-1}
b=5x10^{21}s^{-1}

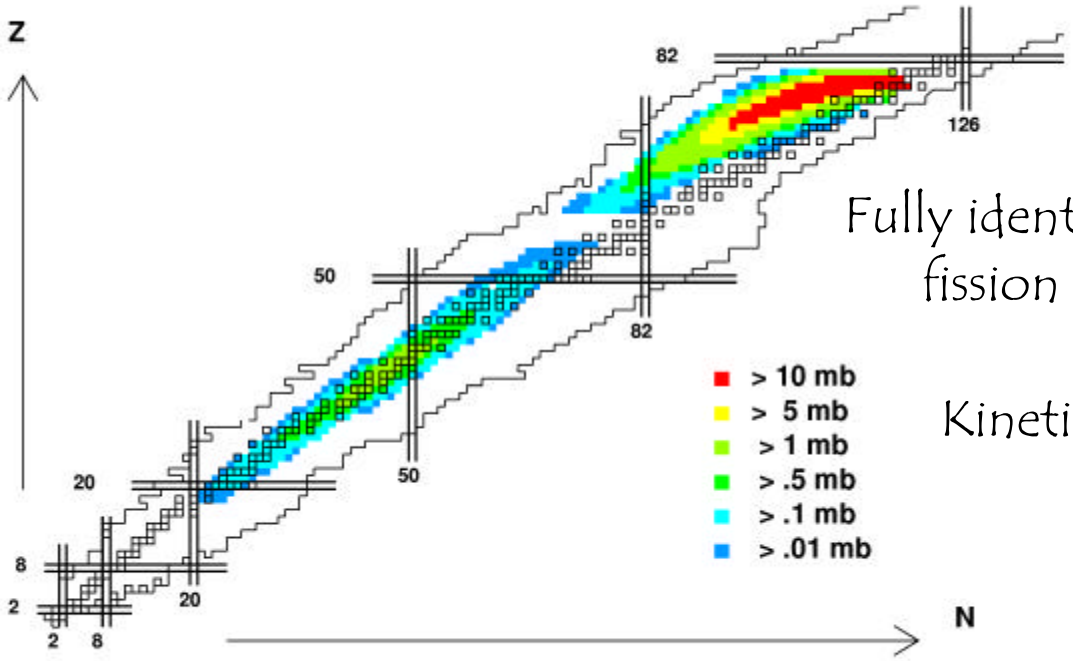
Best description *b* = **2x10^{21}s^{-1}**

Fission of ^{197}Au at 800 A MeV on Proton

(J. Benlliure et al., accepted for publication in Nucl. Phys. A)

FRS



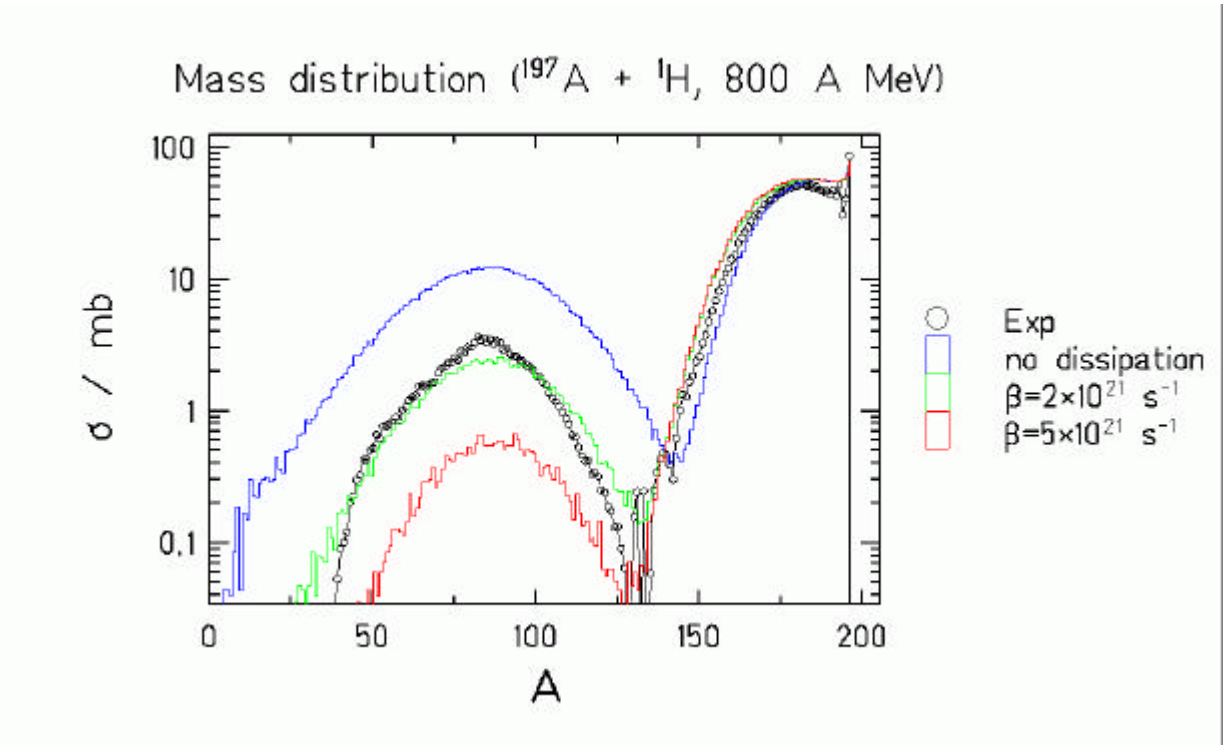


Fully identification of 1 fission fragment

+

Kinetic energy

Results



Total fission cross section and width of the mass distribution are reproduced with $b = 2 \times 10^{21} s^{-1}$

Conclusions and Outlook

- Signatures of dissipation at small deformations have been observed for heavy and light fissioning nuclei

- Similar conclusions derived from different experimental approaches

- Future experiments

Full identification of both fission fragments

Measurement of evaporated particles

Remove model dependence

Temperature dependence of dissipation?