

Characterization of reaction residues produced in collisions induced by $^{238}\text{U}(1\text{AGeV})$ on proton and deuterium

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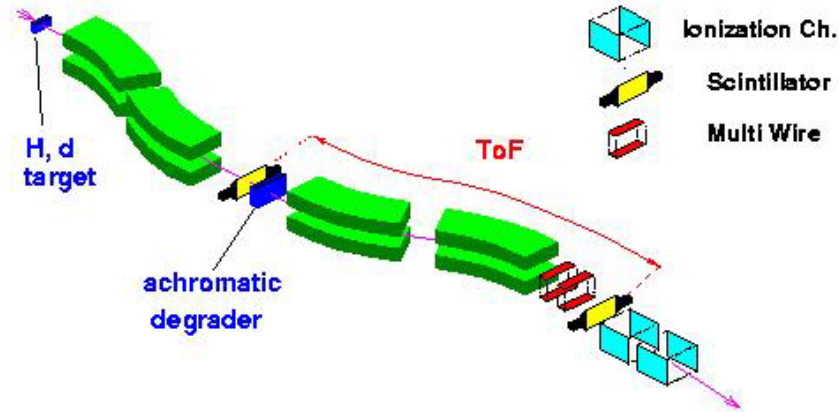
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Motivations:

Precise isotopic production cross sections and momentum distributions of spallation residues

- Inventory of radioactive species in spallation-neutron sources
- Production of exotic nuclear beams in ISOL facilities
- Dynamics of fission
- Energy deposition in spallation reactions
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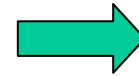
Experimental technique: Inverse kinematics + magnetic separation



Identification in (A/Z):

$$\left(\frac{A}{Z}\right) = B\rho_2 \frac{\text{ToF}}{L} c \sqrt{1 - \left(\frac{L}{c\text{ToF}}\right)^2}$$

$$B\rho_2 = B\rho_0 \left(1 + \frac{M \cdot x_4 - x_2}{D}\right)$$



• Time-of-Flight (ToF)

• Positions (x_2, x_4)

Identification in Z:

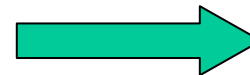
$$Z \approx \sqrt{\Delta E}$$



• Energy loss (ΔE)

Longitudinal velocity (momentum):

$$\beta\gamma = \frac{Z}{A} \left(1 + \frac{x_2}{D}\right)$$

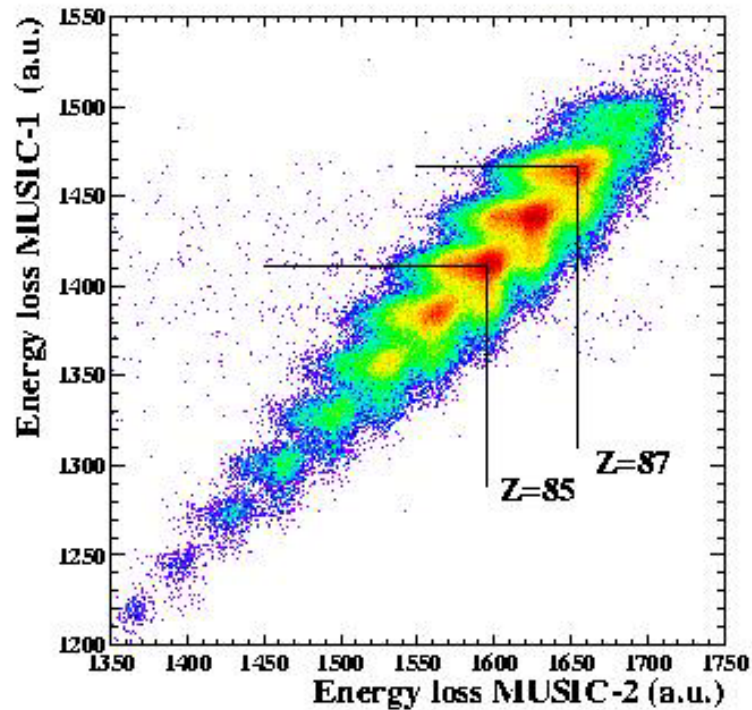


• Position (x_2)

Charge separation of heavy residues

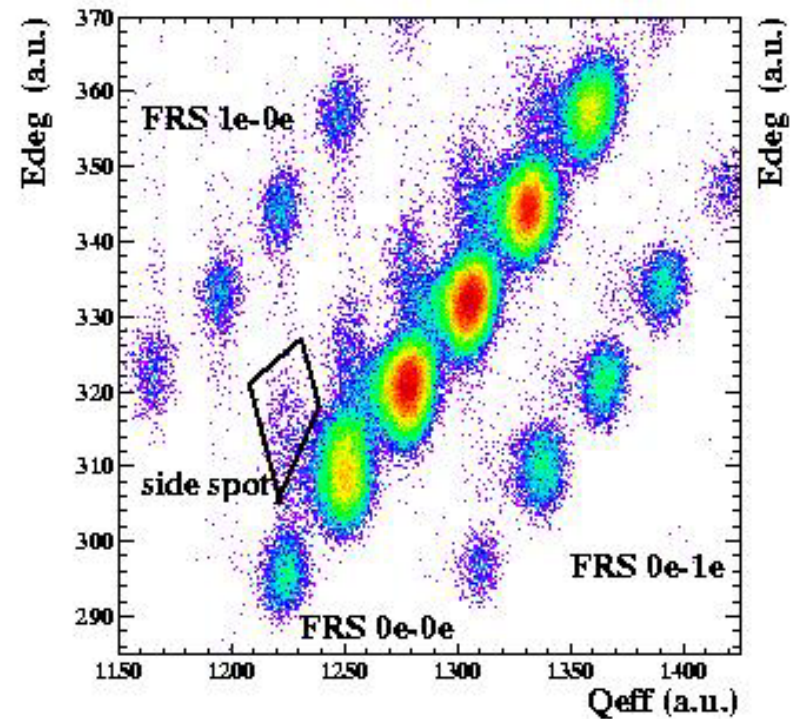
Limited resolution with
MUSIC detectors

(Two-fold measurement)

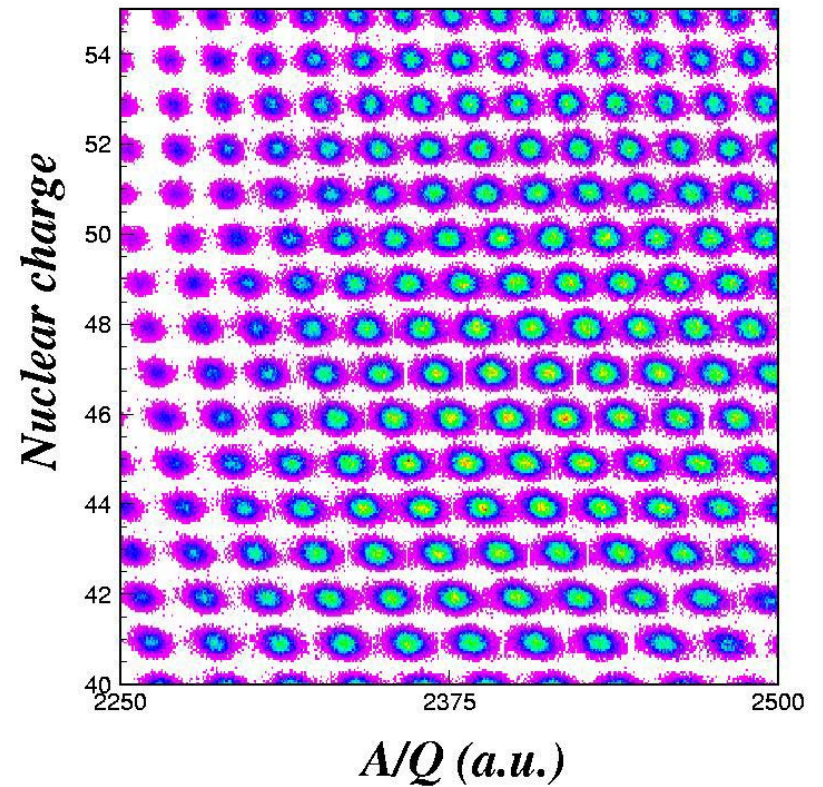
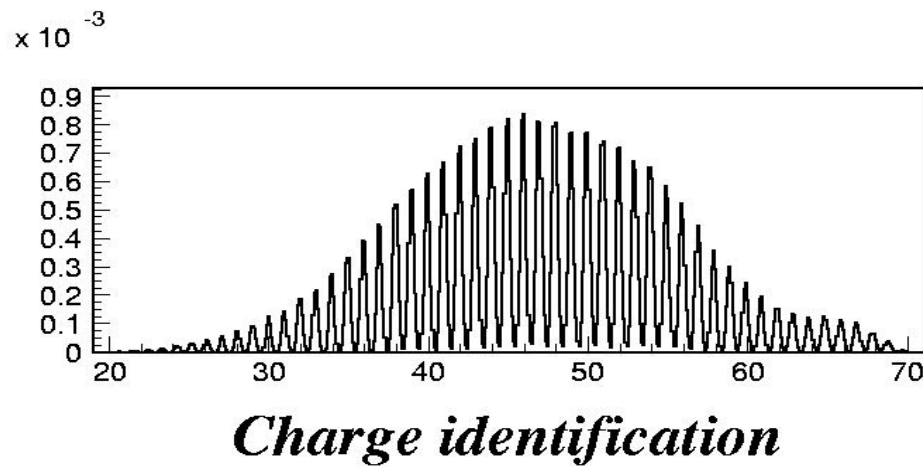


Contamination due to charge
states

(Energy loss in the degrader)



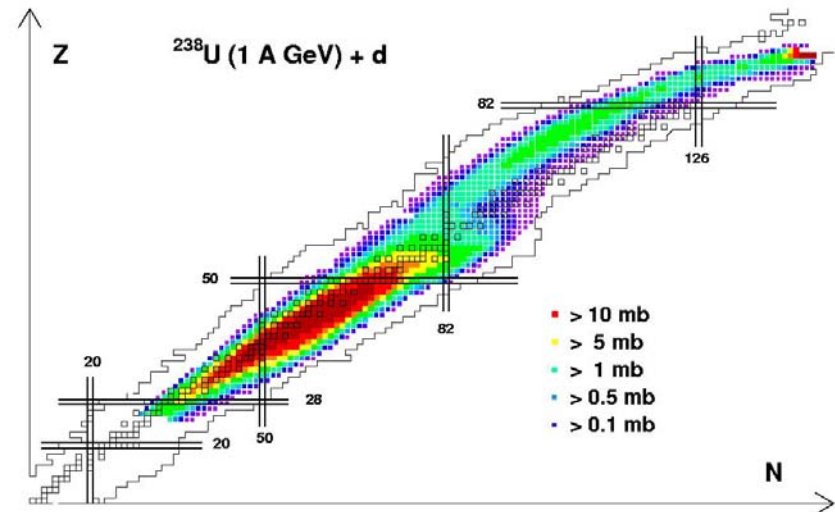
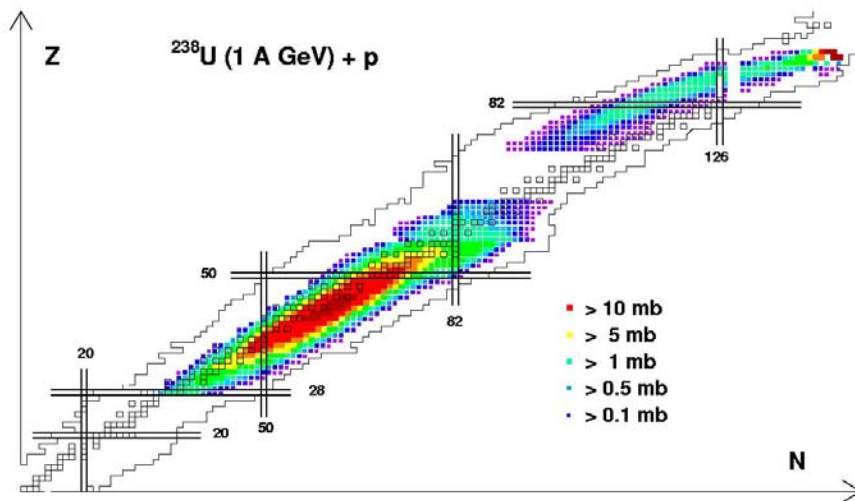
Mass and charge resolutions

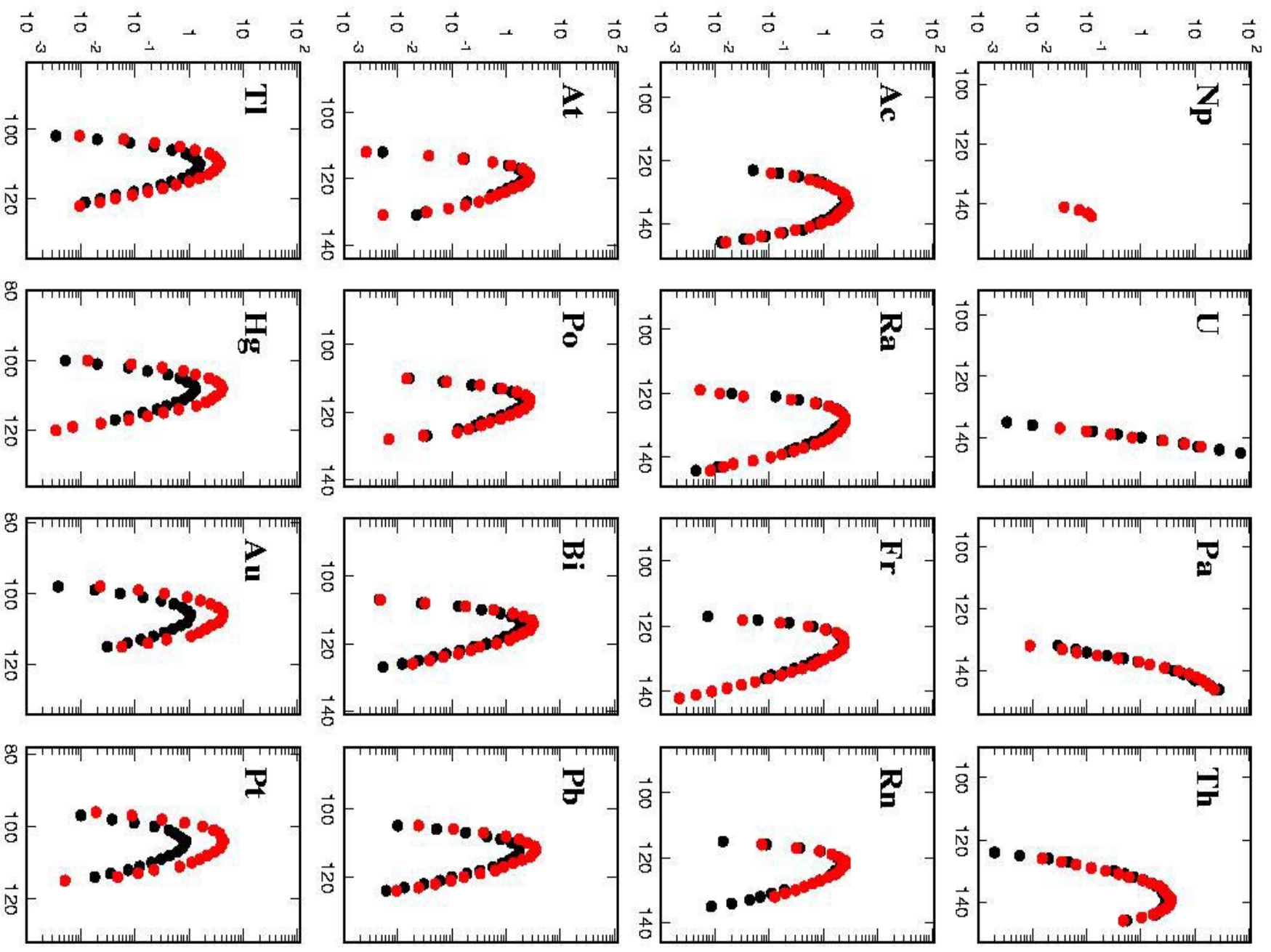


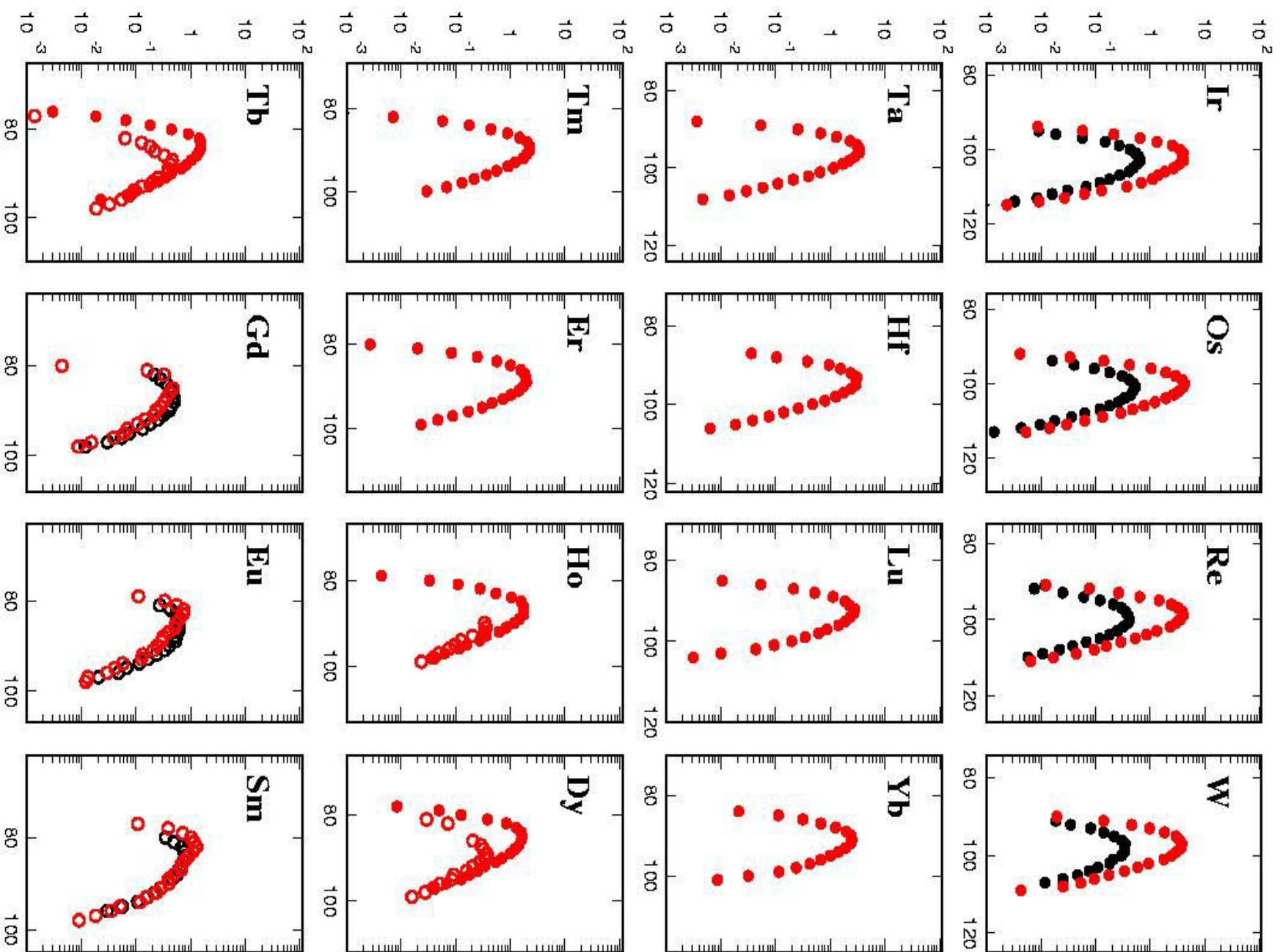
Fragmentación and fission residues produced in $^{238}\text{U}(1\text{A GeV})+\text{p}, \text{d}$

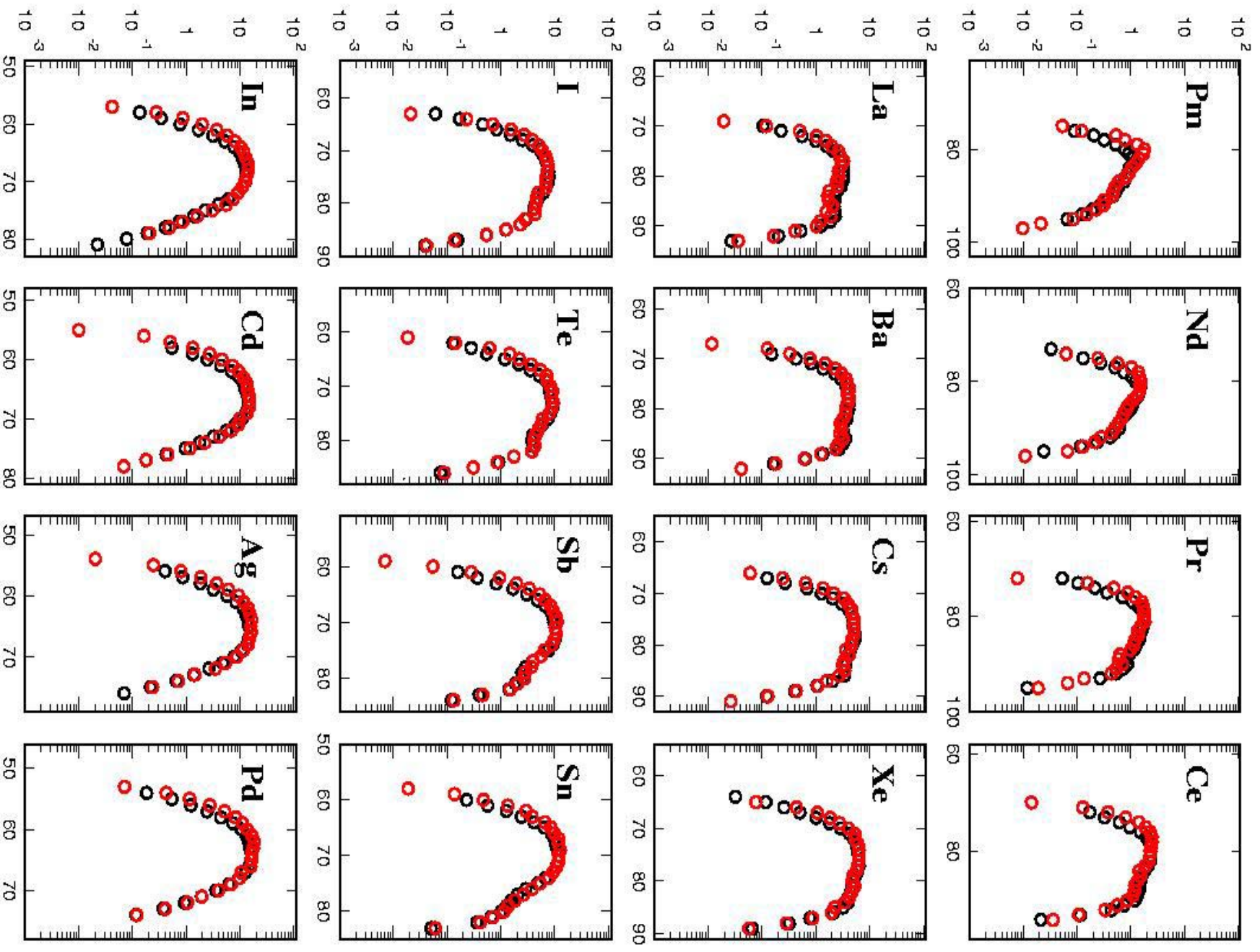
1205 nuclei produced in $^{238}\text{U}+\text{p}$

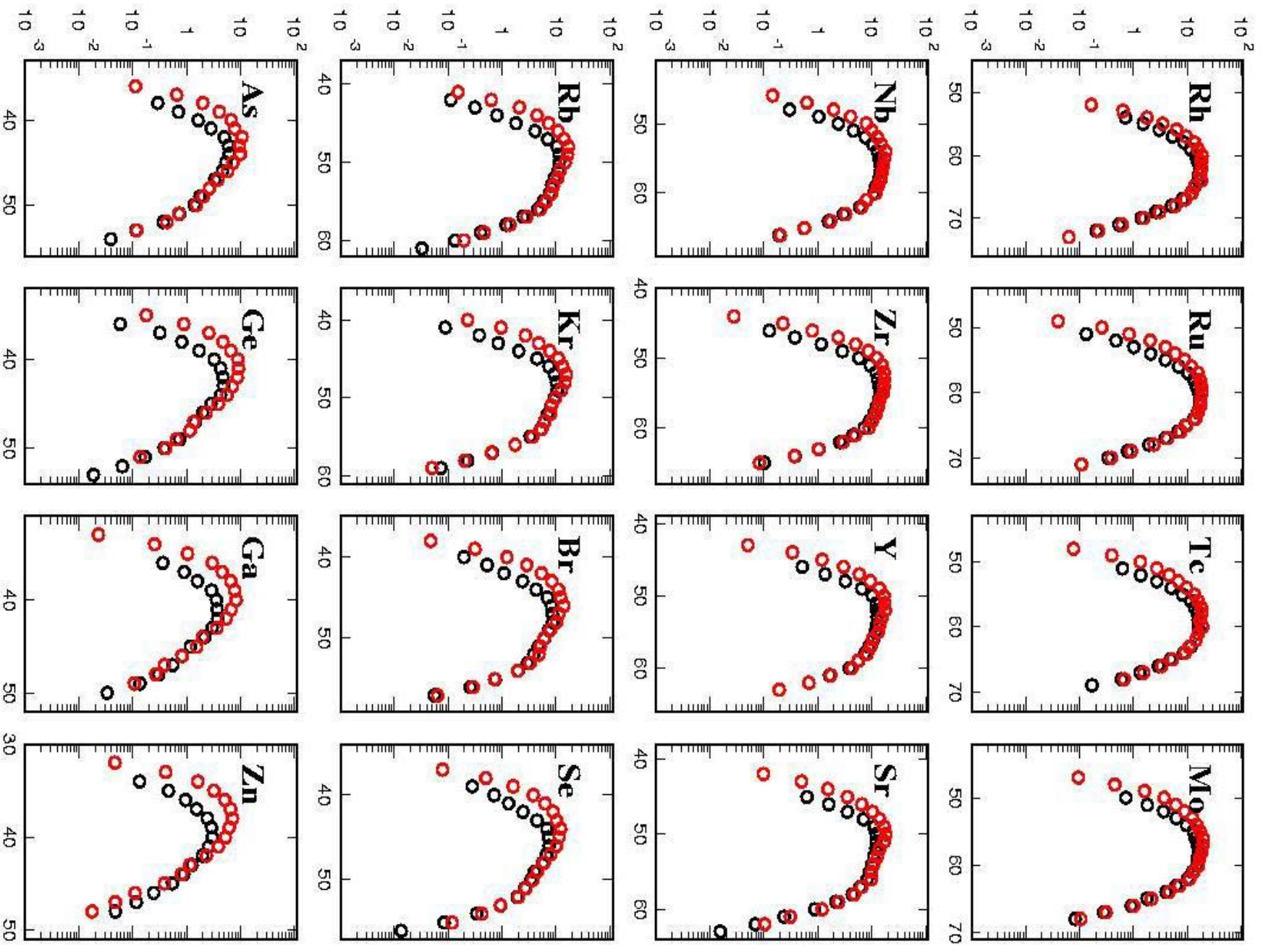
1303 nuclei produced in $^{238}\text{U}+\text{d}$

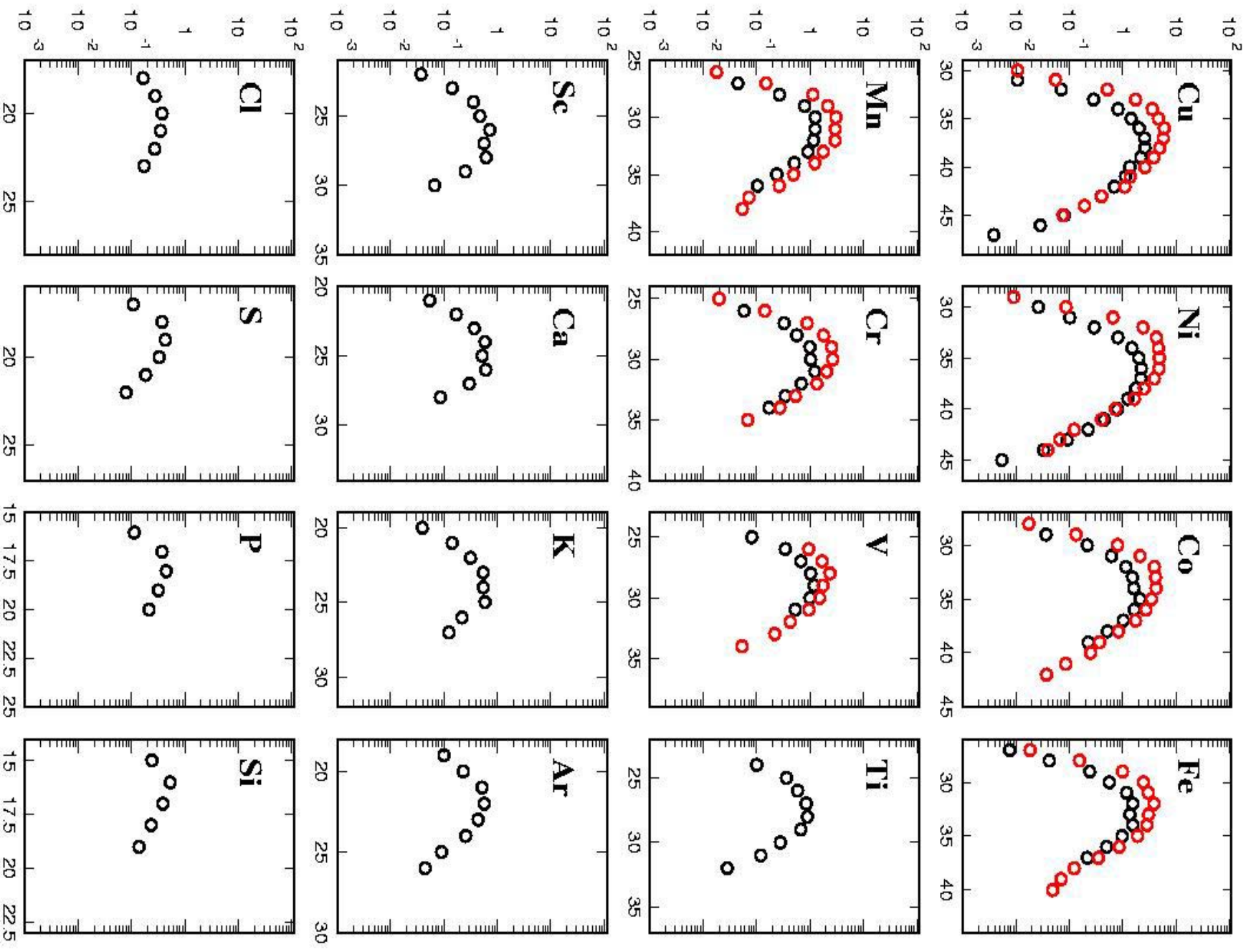


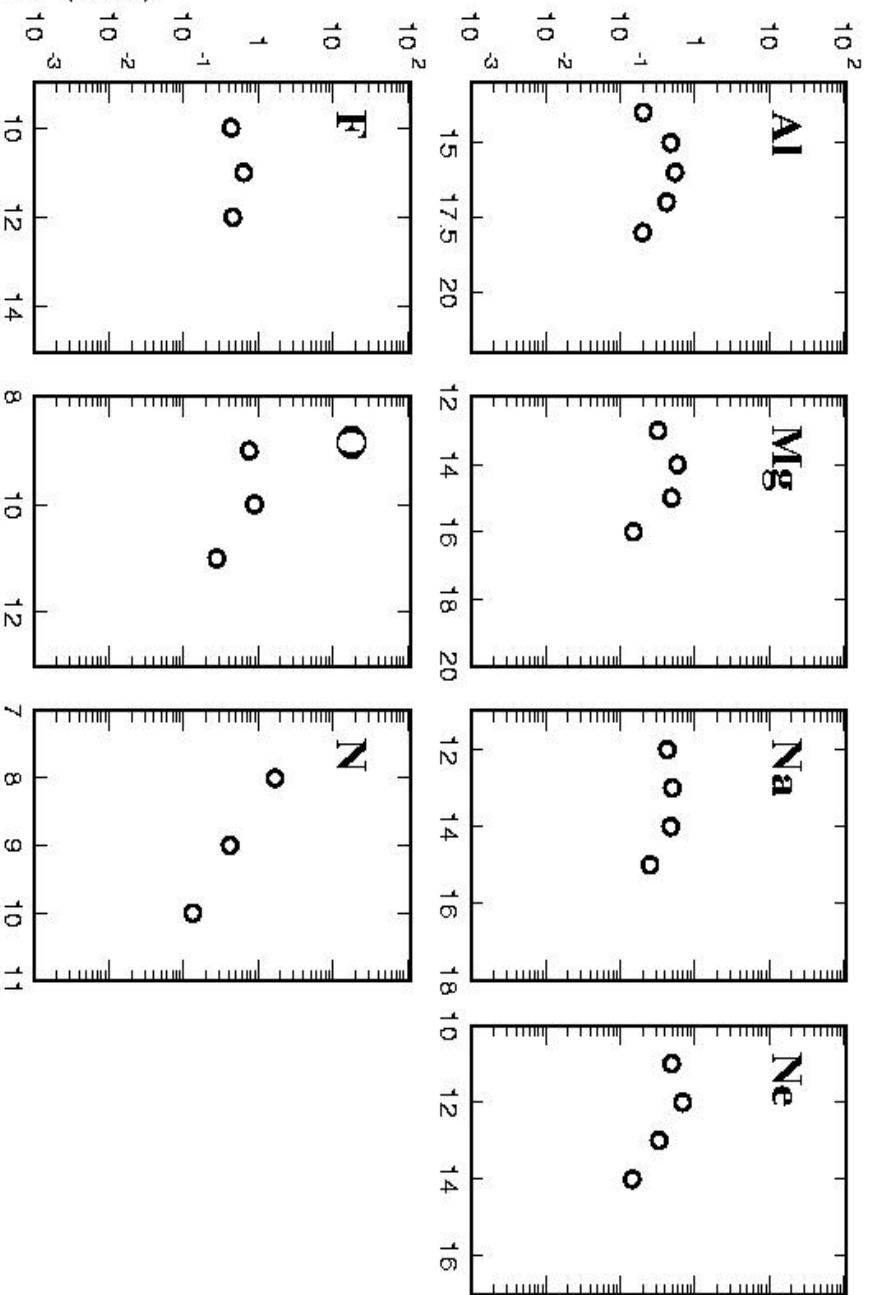








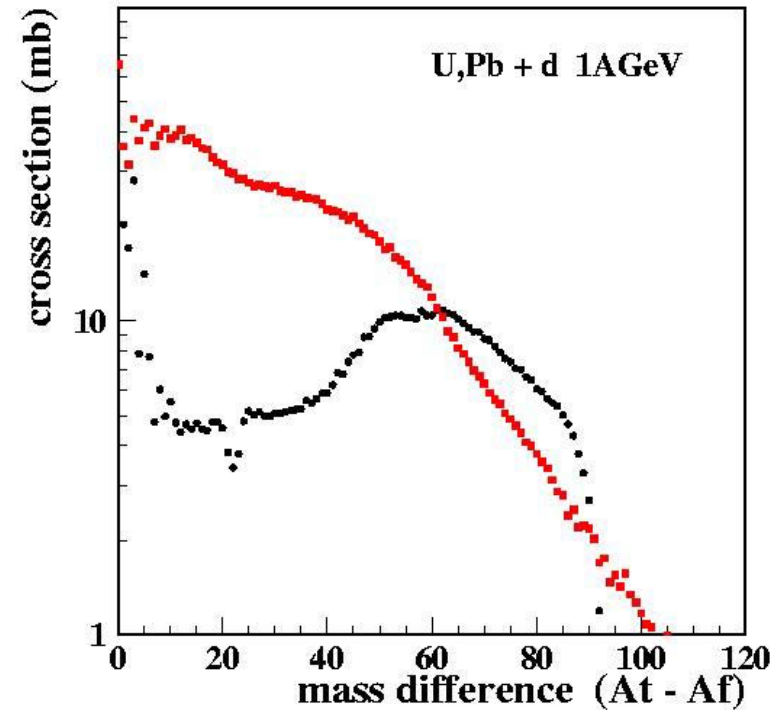
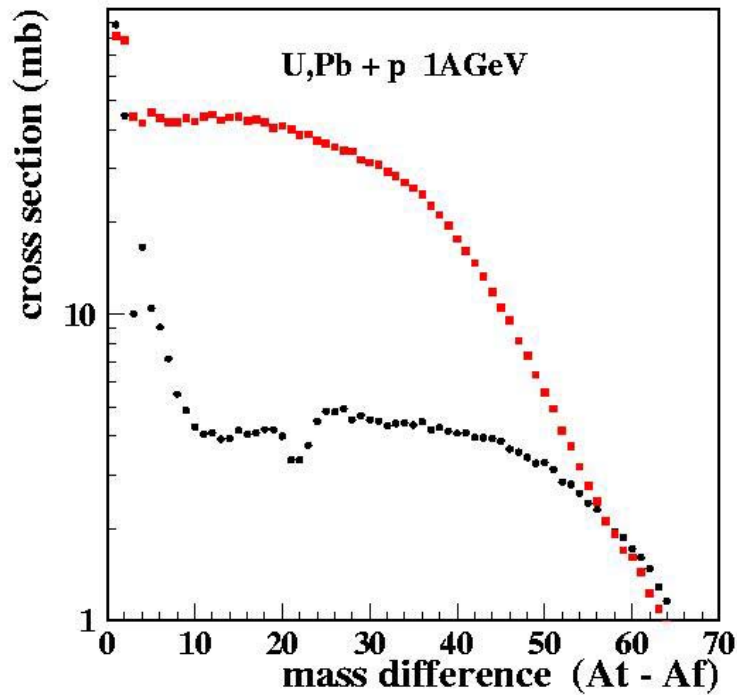




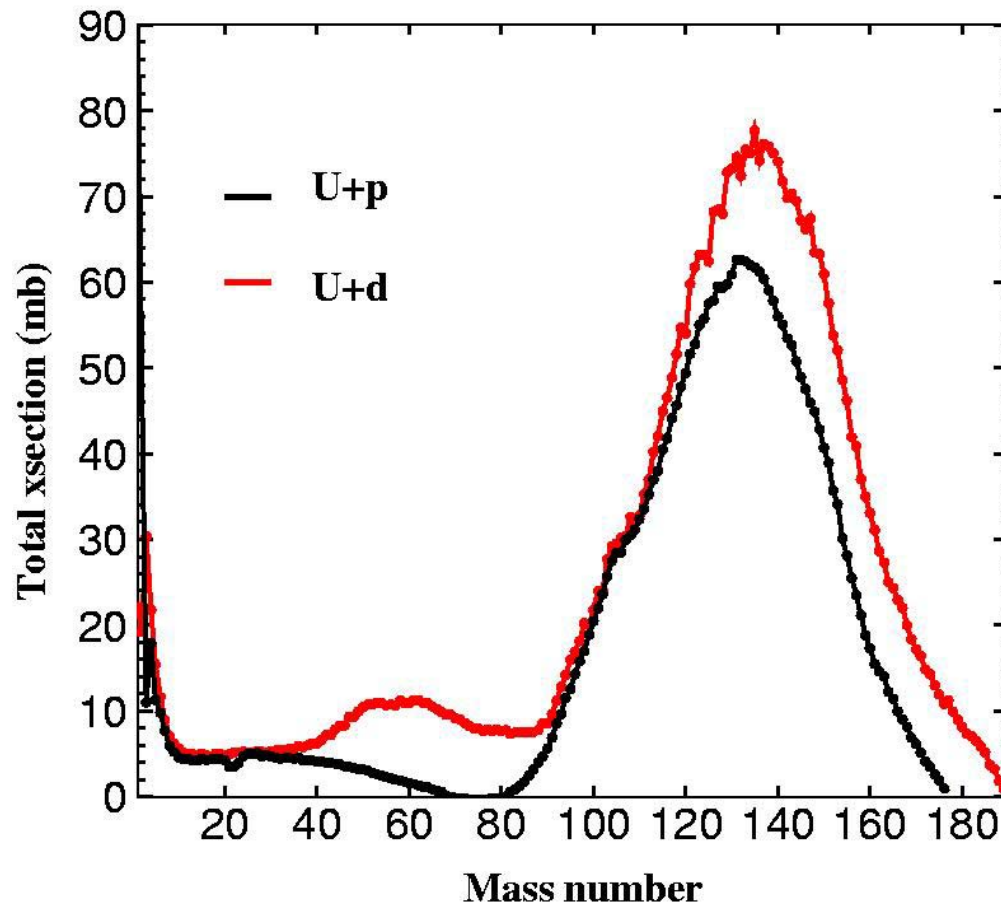
Mass number

Isobaric cross sections

The role of fission in reactions with ^{238}U



Isobaric cross sections



Velocity and momentum distributions

