Measurement of fission at HRIBF

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- Introduction
- Apparatus – annular strip detector
- Data reduction
- Preliminary results
- Future plans
Introduction

- Study fusion near the Coulomb barrier with radioactive beams.
- The compound nucleus can decay by particle evaporation and fission. D Shapira will discuss ER measurements.
- For heavier systems, separating deep inelastic collision from fission is required.
- Quasi-fission occurs when the di-nuclear system fails to evolve into a compound nucleus.
- Barrier penetration models predict the capture inside the fusion barrier.
- Discuss fusion-fission induced by Sn and Te projectiles in inverse kinematics.
Apparatus

- Micron Semiconductor S2
- 64 concentric strips
- 16 pie-shaped sectors
- 4.2 cm from the target
- $\theta$ range 15°-43°
- 1 mg/cm$^2$ target

fragment-fragment coinc.
Data Reduction

Stable beam test

529 MeV $^{124}$Te+$^{64}$Ni

coincidence data
Folding angle distributions

Strip No.

Fiss

DIC
Folding angle distributions

Strip No.

No. of Counts

550 kV Fiss folding angle distrib.  
550 kV DIC folding angle distrib. D=40 kV

Fiss

DIC
Cross section

- normalize to the integrated beam in the ion chamber
- normalize to the elastic scattering detected at forward angles (inner strips)
- efficiency: 4.5%
- $\sigma_{\text{fis}} = 337 \pm 33 \text{ mb}$
- statistical model (PACE2):
  - $\sigma_{\text{Bass}} = 363$
  - $\sigma_{\text{ER}} = 83$
  - $\sigma_{\text{fis}} = 280 \text{ (mb)}$

WS Freeman et al., PRL50 (1983) 1563.
KT Lesko et al., PRC34 (1986) 2155.
\(^{132}\text{Sn} + ^{64}\text{Ni}\) measurement

560 MeV
I\(-25\) kpps for 17 hr.
Excitation function
Future Plans

- Improve particle energy measurement (shaper)
- Mass and/or charge distributions

290 MeV $^{58}\text{Ni} + ^{124}\text{Sn}$

Summary

- We have measured fission cross sections for $^{132}\text{Sn}$ on $^{64}\text{Ni}$ with an annular DSSD in a close geometry.
- Deep inelastic collision is a major channel in this reaction with a cross section larger than that of fission.
- We plan to measure mass and/or charge distributions in future experiments to better separate DIC events from fission.

Collaborators

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