RIB Experiments Near the Coulomb Barrier at MSU

W. Loveland
Oregon State University
Scientific Opportunities

• Fusion: n-rich nuclei, fusion enhancement
  halo nuclei, breakup vs enhancement
• Fission: fission barriers as a function of (Z,A), isospin macrophysics
• Statistical Model: measurement of a, ρ, Γ
• Elastic Scattering: Coulomb vs, nuclear
• Low Energy Nuclear Structure Studies
Experimental Approaches

- ISOL—Re-accelerated Beams
- PF---Degraded Beams—A Poor Man’s Approach
- PF—The RIA Approach
Oak Ridge
Challenges and Opportunities

- Rates vs Isobaric Purity:
  \[ ^{132}\text{Sn} \text{ light nuclei } 3000/s; \text{ heavy nuclei } 600/s \]
  \[ ^{134}\text{Te} \text{ } ^{134}\text{Sb}^\text{m} 1\%, \text{ } ^{134}\text{Te} 88\%, \text{ } ^{134}\text{Im} 4.1\%, \text{ } ^{134}\text{I} 6.9\% \]
  \[ \sim 10^5/s \text{ for heavy nuclei} \]

- Our Experiment:
  \[ ^{122,134}\text{Te} + ^{90,96}\text{Zr} \text{—a test of the isospin dependence of fusion hindrance.} \]
Challenges

- Impurities: $10 - 15\%$
- Rates: $10^2 - 10^4$/s
- Where to Degrade: GANIL solution
- Stable Beam Comparisons:
- Reaction Product Detection:
  - Fission
  - Radioactivity
  - Residues
- Improvements: ORNL imaging mcps, other tracking devices, high rate DAQ