Systematic studies of global nuclear properties of isotopically separated nuclei have been extremely successful.

Established global observables:
- masses $\Rightarrow$ pairing correlations and shell effects
- total interaction cross sections $\Rightarrow$ halo nuclei

New global observable:
- nuclide production cross-sections in nucleus-nucleus collisions $\Rightarrow$ complex phenomena of nuclear structure

Example: $^{238}\text{U} \rightarrow \text{Ti}$ at 1 A·GeV at the FRS (GSI)
1 A GeV $^{238}$U on titanium

Nuclei with enhanced production

+ even-even nuclei
+ odd-even nuclei
EXPERIMENT

PhD Thesis M.V. Ricciardi

Even-mass nuclei

Odd-mass nuclei
CALCULATION

\[ M = M_{LD} - \delta \]
\[ \rho \sim \exp \left(2\sqrt{a(E - \delta)} \right) \]
\[ \begin{cases} 
\delta_{oo} = 0 \\
\delta_{oe} = \delta_{eo} = \Delta \\
\delta_{ee} = 2\Delta 
\end{cases} \]

**Even-mass nuclei**

![Graph of even-mass nuclei](image)

**Odd-mass nuclei**

![Graph of odd-mass nuclei](image)
OUTLOOK

- even-odd structure of even-mass nuclei reveals higher-order structural effects:
  - mean-field contribution to pairing effect
  - alpha clustering
  - neutron-proton pairing

The yield from highly excited nuclei reflecting the number of bound states is a new global observable probing complex nuclear structure phenomena