Layout

- $^{112,118,124}\text{Sn} + ^{112,118,124}\text{Sn}$
- $\sim 5 \text{ mg/cm}^2$ Targets
- 70 MeV/u beam energy
• Miniball->Charged particle multiplicity
• LASSA->Light (Z≤6) fragment distributions
• S800 Spectrograph -> Heavy (Z≈25-45) fragment distributions
Experiment 07038: Precision Measurement of Isospin Diffusion

- Investigates the density-dependence of the nuclear symmetry energy
- $^{112,118,124}$Sn+$^{112,118,124}$Sn Collisions
- Combines the MSU Miniball, the LASSA Array, and the S800 Spectrograph
Experiment 07038: Precision Measurement of Isospin Diffusion
Experimental Trigger

• Miniball Mult=2 + S800 Single
• LASSA taken as a slave
The S800 Spectrometer separates isotopes (Z≈10-50) by comparing $\Delta E$, TOF, and $B_\rho$. 
Beam Rates

• Event rates 200-300/s
• Beam Rate $2 \times 10^7$/s to $6 \times 10^7$/s
• Limited by transmission through S800
• Total Events about 3 million/beam-target-brho, or about 10 million/beam-target
Main Goal: Isospin Transport in Residues

- Different amount of isospin diffusion for heavy residues.

- We will measure the isospin transport for the residue using the S800 spectrograph in addition to measuring the fragment distributions.

\[
E_{\text{sym}}(\rho) = S_k \left( \frac{\rho}{\rho_0} \right)^{2/3} + S_i \left( \frac{\rho}{\rho_0} \right)^{\gamma_i}
\]
The MSU Miniball/WU Miniwall

• Total charged particle multiplicity is related to impact parameter

Figure: Andira Ramos (CEU Poster)
The LASSA Array

LASSA PID

[Graph and image of the LASSA Array with Si energy on the y-axis and CsI energy (ADC channel) on the x-axis.]
Timeline

- Experiment start: May 30, 2011
- Interruption due to cryoplant problems
- Experiment Finish: Oct 19, 2011 (teardown in progress, ask for a tour)
- Data taken (Millions of events):

<table>
<thead>
<tr>
<th>Beam</th>
<th>Target (^{112}\text{Sn})</th>
<th>Target (^{118}\text{Sn})</th>
<th>Target (^{124}\text{Sn})</th>
</tr>
</thead>
<tbody>
<tr>
<td>(^{112}\text{Sn})</td>
<td>11.4</td>
<td>x</td>
<td>8.7</td>
</tr>
<tr>
<td>(^{118}\text{Sn})</td>
<td>3.8</td>
<td>10.7</td>
<td>x</td>
</tr>
<tr>
<td>(^{124}\text{Sn})</td>
<td>12.3</td>
<td>10.1</td>
<td>15.2</td>
</tr>
</tbody>
</table>
Confirm Linearity of $\alpha$ on $\delta$

- $\alpha$ depends linearly on the asymmetry according to statistical and dynamic models.
- Experimentally verified in central collisions.
- Measure $^{118}\text{Sn}$ on $^{118}\text{Sn}$ to add a data point to $^{112}\text{Sn} + ^{112}\text{Sn}$ and $^{124}\text{Sn} + ^{124}\text{Sn}$.