ACTIVE TARGET- TIME PROJECTION CHAMBER

ATTPC
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AT-TPC CONCEPT

- Active-Target Time-Projection Chamber

$Z = v_{\text{drift}} t$

tracking medium

electron amplification

$E$
AT-TPC CONCEPT

- Active-Target Time-Projection Chamber

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Active-Target Time-Projection Chamber

- Electron amplification
- Tracking medium

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AT-TPC CONCEPT

- Imaging of charged particle tracks
- Active-target (target and tracking medium the same)
- Increase in luminosity (thick target)
- Good energy and angle resolution even at low-energy
- $4\pi$ acceptance of reaction products
- Low-intensity RIB’s
- Scan energy range
AT-TPC

We can measure:
- Angle
  - Tracking
- Energy, momentum
  - Bragg curve
  - B-rho analysis
- Cross Sections

- 1 m length, 50 cm diameter
- Electrons amplified using a Micromegas with 10,240 triangular pads
- Embedded in a 2T magnetic field for B-rho analysis
- Detector already commissioned with a $^4\text{He}$ beam in ReA3.

Event recorded during commissioning.
• Reaccelerated rare isotopes
• Lower energies, up to 3 MeV/n, 12 MeV/n
• Rates from $1 \cdot 10^3$ pps for more exotic beams
### Table 1: Overview of the AT-TPC scientific program.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Physics</th>
<th>Beam Examples</th>
<th>Beam Energy (A MeV)</th>
<th>Min Beam (pps)</th>
<th>Scientific Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer &amp; Resonant Reactions</td>
<td>Nuclear Structure</td>
<td>$^{32}$Mg(d,p)$^{33}$Mg, $^{26}$Ne(p,p)$^{26}$Ne, $^{66,70}$Ni(p,p)</td>
<td>3</td>
<td>100</td>
<td>Kanungo</td>
</tr>
<tr>
<td>Astrophysical Reactions</td>
<td>Nucleosynthesis</td>
<td>$^{25}$Al($^3$He,d)$^{26}$Si</td>
<td>3</td>
<td>100</td>
<td>Famiano, Montes</td>
</tr>
<tr>
<td>Fusion and Breakup</td>
<td>Nuclear Structure</td>
<td>$^8$B + $^{40}$Ar</td>
<td>3</td>
<td>1000</td>
<td>Kolata</td>
</tr>
<tr>
<td>Transfer</td>
<td>Pairing</td>
<td>$^{56}$Ni + $^3$He</td>
<td>5-19</td>
<td>1000</td>
<td>Macchiavelli</td>
</tr>
<tr>
<td>Fission Barriers</td>
<td>Nuclear Structure</td>
<td>$^{199,201}$Tl, $^{192}$Pt</td>
<td>20 - 60</td>
<td>10,000</td>
<td>Phair</td>
</tr>
<tr>
<td>Giant Resonances</td>
<td>Nuclear EOS, Nuclear Astro.</td>
<td>$^{54,106}$Ni - $^{70,127}$Sn, $^{106}$Sn - $^{126}$Sn, $^{37,49}$Ca</td>
<td>50 - 200</td>
<td>50,000</td>
<td>Garg</td>
</tr>
<tr>
<td>Heavy Ion Reactions</td>
<td>Nuclear EOS</td>
<td>$^{106}$Sn - $^{126}$Sn, $^{37}$Ca - $^{49}$Ca</td>
<td>50 - 200</td>
<td>50,000</td>
<td>Lynch</td>
</tr>
</tbody>
</table>
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PUBLICATIONS


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