Polarized beams at HIE-ISOLDE – from dreams to reality.

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Polarized beams – WHY?

Precise test of the nuclear models for exotic nuclei:
- transfer reactions → \( j = \ell \pm \frac{1}{2} \)
  (analyzing power)
- Coulomb excitation – spin/parity; multiplicity assignments etc.
- nuclear moments – proton/neutron character, angular momentum \( j \)

\[
A_y = \left( \frac{d\sigma}{d\Omega} \right)_{\uparrow} - \left( \frac{d\sigma}{d\Omega} \right)_{\downarrow} \left( \frac{d\sigma}{d\Omega} \right)_{\downarrow} + \left( \frac{d\sigma}{d\Omega} \right)_{\uparrow}
\]
Can one do it and how?

Tilted Foils - the principles:
• atomic polarization $\rightarrow$ nuclear polarization
• higher nuclear spins $\rightarrow$ higher polarization (>10% achieved so far)
• strong velocity dependence (poorly studied up to now)

![Graph](image)

- Can one post-accelerate the ions after polarizing them? done for stable beams - noble-gas like charge states + LINAC

$\leftarrow$ J. Bendahan et al., ZPA 331, 343 (88)

M. Hass et al., NPA 414, 316 (84)
What do we need to achieve it?

β-NMR setup from HMI Berlin transferred to ISOLDE

- gain of complete control on the TF polarization
- nuclear structure (moments, reactions ...),
- nuclear methods in the solid-state physics,
- biophysics etc. ...

3 MeV/u and 0.3 MeV/u