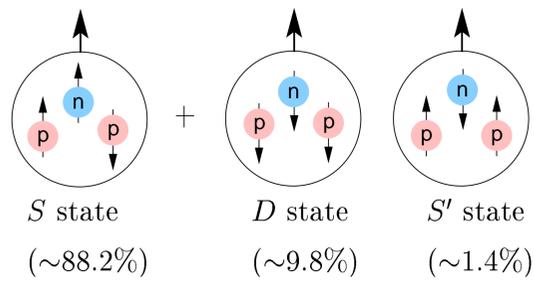


The Polarized ^3He Target at Jefferson Lab Hall A

Why Polarized ^3He ?



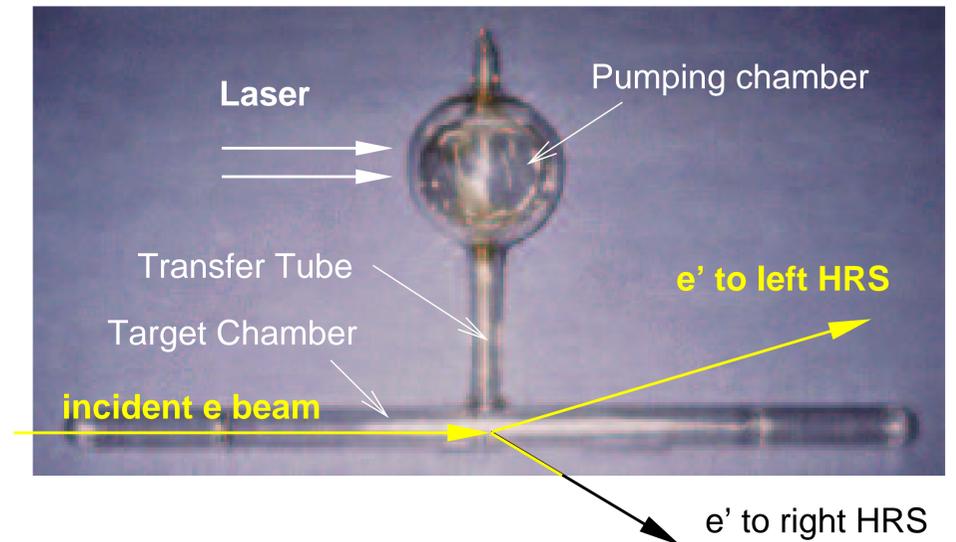
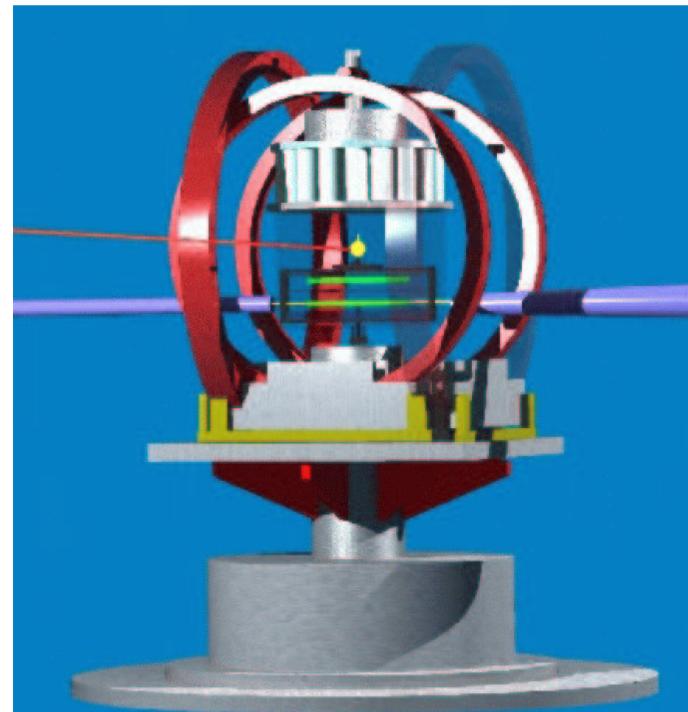
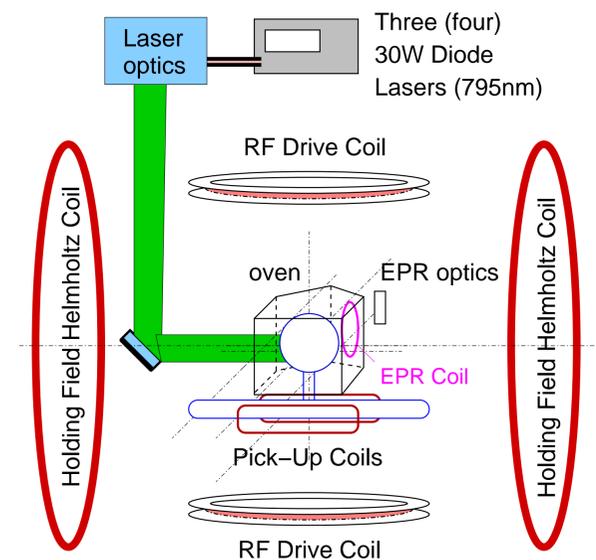
Effective nucleon polarizations:

$$P_n = 86\%, P_p = -2.8\%$$

Effective Neutron Target

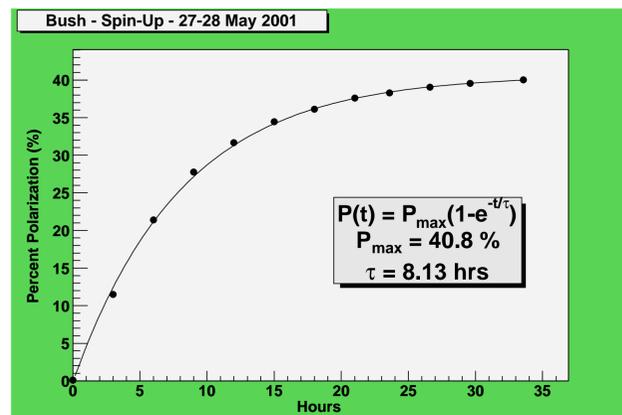
$$^3\vec{\text{He}} \approx \vec{n}$$

Target Setup



Principle of Operation

- Optical pumping of Rb
- Spin exchange between Rb atom and ^3He nuclei



Cell Characteristics

High pressurized glass cells:

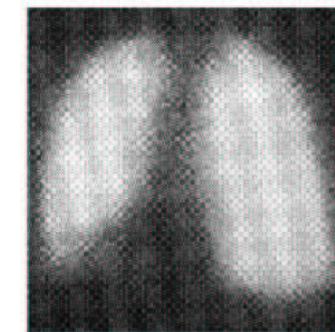
- cell length: 40 cm
- ^3He density: ~ 10 atm
- $P \sim 40\%$ with $12 \mu\text{A}$ beam
- Polarimetries: \diamond NMR \diamond EPR
- Highest Polarized luminosity of the world: $1 \times 10^{36} \text{ cm}^{-2}\text{s}^{-1}$

Physics Program

- Neutron Spin Structure
 - GDH (1998), A_1^n , g_2^n (2001)
 - low Q^2 GDH, g_1^n duality
- Neutron Form Factors
 - G_M^n (1998)
 - G_E^n
- Key program @ 12 GeV Upgrade

Medical Application

lung image



- | | |
|--|---|
| <ul style="list-style-type: none"> • Traditional method • Radioactive ^{133}Xe + gamma camera • Resolution: $1\sim 2$ cm | <ul style="list-style-type: none"> • Noble-gas imaging • Polarized ^3He gas + MRI • Resolution: a few mm |
|--|---|