

Polarized ^3He target: consideration for Hall C

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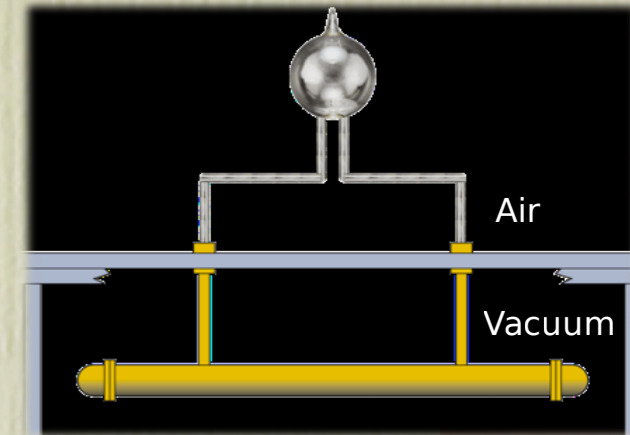


Meeting on Polarized ^3He Target for 12 GeV Experiments
August 15, 2012

Requirements for A_1^n and d_2^n

(from updated proposals)

- ✓ 60 cm Alkali-hybrid cell, 12 amg
- ✓ 2 transfer tubes for convection
- ✓ Gold-plated Aluminum target chamber
- ✓ Pulsed NMR



A_1^n

- Target: 60% polarization with 60 μ A and 3% rel. syst. on polarimetry
- Beam: 85% polarization and 1% rel. syst. on polarimetry

(684hrs DIS + Res) + (169 hrs calib./comm./overhead) =
853 hours (35.5 pac days) total

d_2^n (update PAC36)

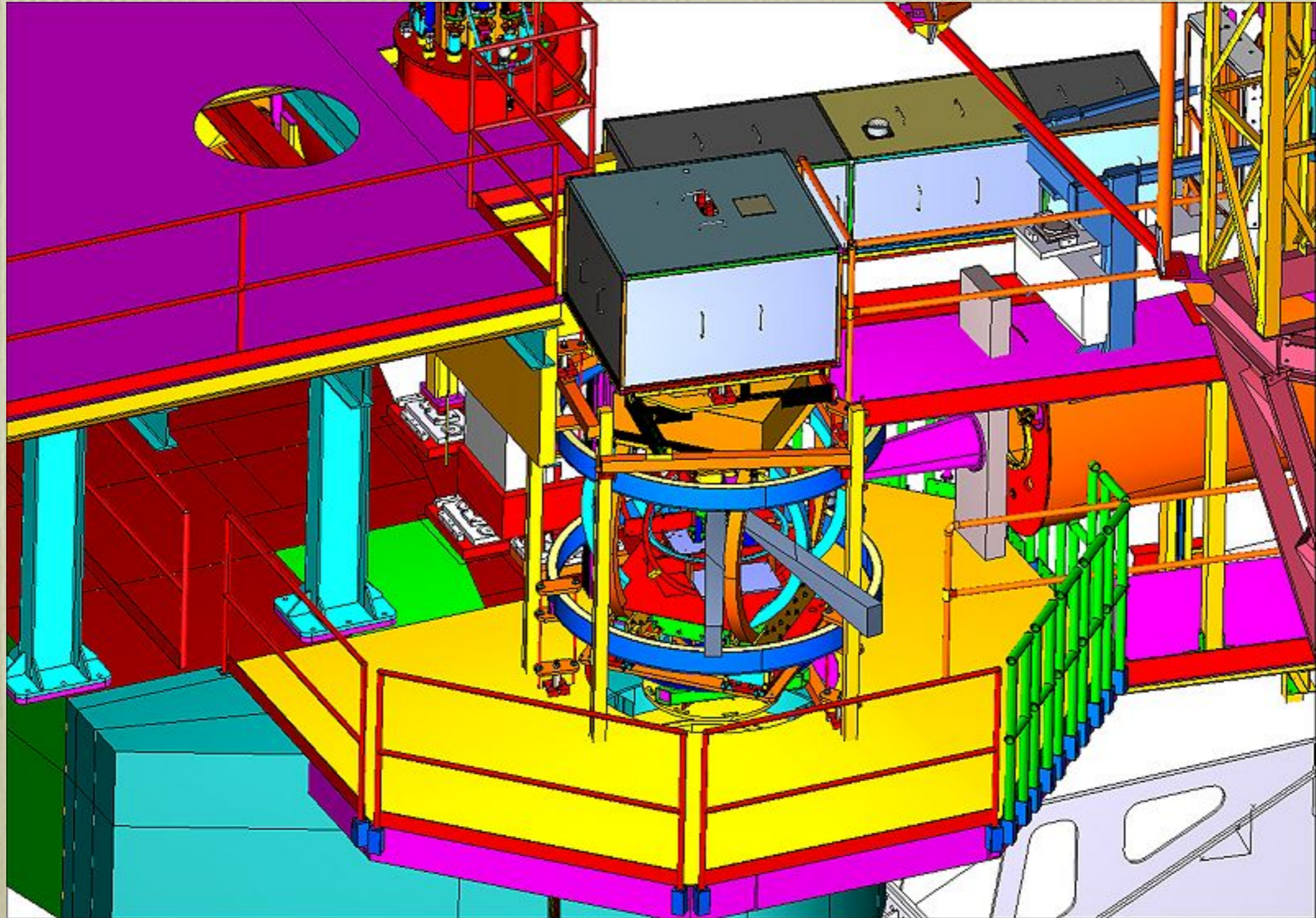
- Target: 55% polarization with 30 μ A and 3% rel. syst. on polarimetry
- Beam: 80% polarization and 1.5% rel. syst. on polarimetry

(125hrs * 4 conf.) + (200hrs calib./comm./overhead) =
700 hours (29 pac days) total

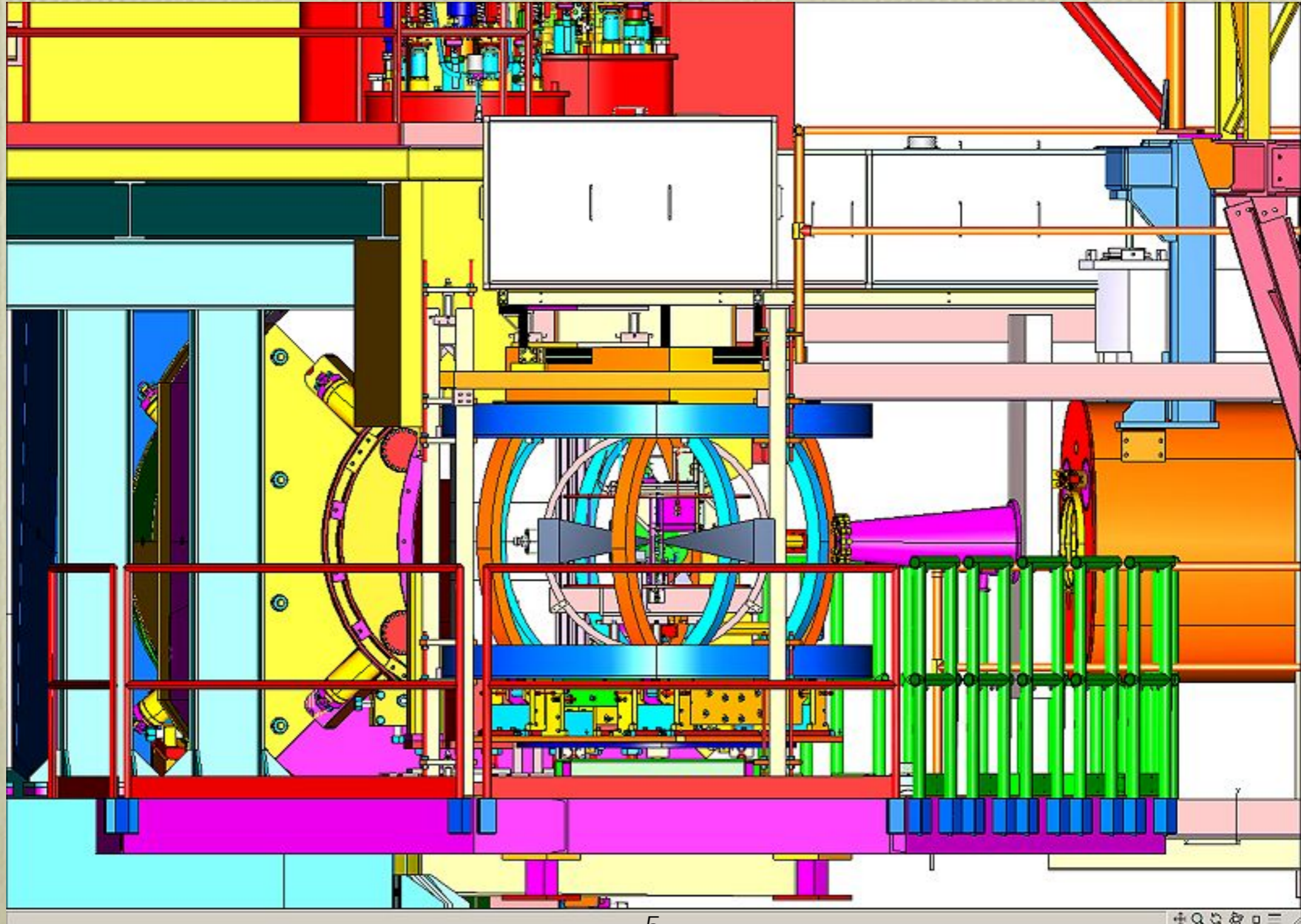
Installation in Hall C

- **Existing target system:** tight fit on Hall C platform
- **Lots of room above platform:** no problem to move up the entire existing Helmholtz coils system to align target chamber with beamline while keeping the pumping chamber close to the center
- **Optical fibers best path** from laser room to Hall C target pivot was identified by Joe Beaufait: through counting house floor and along the beamline (about 350 feet, to be safe).
- **Optical fibers purchase:** they need to be installed during the LSD but not enough money in FY13 allocated at present to pol. ^3He to order them

Hall A polarized ^3He system in Hall C



Hall A polarized ^3He system in Hall C



Hall C projected budget

Assuming Hall A runs first (some equipment will be carried over to Hall C)

Hardware:

- Glass cell
--> 10 cells @ \$4-6K per cell ----- \$60K
 - ^3He gas
--> 12 liters/cell @ \$650/liter ----- \$78K
 - Optical fiber
--> 10 100m-fibers and connectors ----- \$200K
 - Lasers
--> 6 30W lasers @ \$26K/laser ----- \$156K
 - Electronics:
--> electronics spares ----- \$100K
-
- \$594K

People:

- 1 FTE designer/engineer for 2 years
- 3 FTE technicians for 3 months for installation
- Physicists and students

Hall C 12 GeV Polarimetry

D. Gaskell

Møller Polarimeter

- 6 GeV operation: uses 2 quads to focus Møller events on detector plane, systematic error $dP/P < 1\%$ at low currents
- 11 GeV operation requires additional quad, altered tune, systematic error will be slightly larger (still under evaluation)
- Møller polarimeter will be ready from day 1 (October 2014)

Compton Polarimeter

- Newly installed for Q_{Weak} – similar to Hall A system (FP cavity, diamond strip electron detector, photon detector) – electron detector analysis should yield $dP/P < 1\%$
- 11 GeV operation requires changes to dipole chicane (57 cm deflection → 13 cm)
- Assuming same laser system (1700 W green) and similar backgrounds in electron detector, 1% measurement in <30 minutes at 11 GeV (10 μ A)
- Design work just began for upgrade – Compton may not be ready for first beam – depends on scope of work, etc.