Update on Polarized ^{3}He Target

Jian-ping Chen, Jefferson Lab

A1n/d2n Collaboration Meeting, July 24, 2019

- Target for A1n/d2n
- Current status
  - Engineering/mechanical
  - Target system
  - Poalrimetry and Tests
- Plan

Polarized He3 Target for A1n/d2n

Hall C A1n/d2n goals:

- **30 uA on 40 cm , ~10 atm, L ~ 2.2×10^{36} $cm^{-2}s^{-1}$**
- **In-beam polarization ~ 55 %,**
- **Polarization measurement precision ~ 3%**
- **Except each cell last for about one month beam**

  needs ~ 6 cells for both A1n/d2n + spares

Update on target status

Status on target system, polarimetry, controls:

- Target system fully functional
- Tests, calibrations and studies on going at JLab target lab:
  Cell testing/optimization (Mingyu Chen and Junhao Chen)
  test on Savior completed, water calibration next
  will continue test on Fulla (once it arrives from UVa)
- Pulse NMR (Mingyu), Lock-in/DAQ system working now
- EPR (Melanie Rehfuss), new fiber connection for EPR light detection working now. EPR calibration on Savior with various conditions complete
- Control/EPICS (Junhao, Arun Tadepalli, Brad, …)
- Instrumentation location, layout, cabling (Junhao)
- Safety/trainings

Update on components

Status on laser, fibers, optics:

- **9 Lasers/long fibers/in hand. Will order more laser as spares.**

- **4-1 combiners tested. Works well with slight temperature increase.**
  Connection with long fibers, slight mis-match in size.
  Vendor agreed to replace with same size as long fibers
  option/backup plan: long fibers fuse to 4-to-1 combiner.

- **Some short fibers coating slowly deteriorating**

- **Compensating optics for transverse pumping**

Cells, Mechanical Parts, Installation, Documents

Current Status on cell production, mechanical, …

- Target cells (Gordon Cates talk)
  - W&M group joined production Jan/Feb
  - Speed up the pace for cell production, ~ 1 cell every 2 weeks
  - 4 usable cells (~ 40-50 %) as of 2 weeks ago

- Updated design and installation design all complete
  - Mechanical parts ordered/arrived for installation
  - Parts in storage available and checked

- Installation plan and preparation (Walter's talk)

- Documents: target OSP and LSOP approved (needs update)

On Site People Power and User Activities

At JLab: students + engineer/designer + JP + …

- Three graduate students + 1

  Junhao Chen (W&M, Todd's group)

  Mingyu Chen (Uva, Xiaochao's group)

  Melanie Rehfuss (Temple, Zein-Eddine's group)

  Roy Murchhana (Kentucky, Wolfgang's group) (end of August?)

  Arun Tadepalli (JLab postdoc), Brad Sawatzky (controls)

At user target labs :

- UVa (Gordon Cates):

  cell fabrication (Gordon's talk)

- W&M (Todd Averett)

  Reference cell system/cooling jets testing (Todd's talk)

  cell fabrication

- Kentucky (Wolfgang Korsch)

  field direction measurement (Roy Murchhana's talk)

Plan

- **Complete testing:**
  - **Complete full testing of Savior (1st cell)**
  - **Water calibration in target lab cross calibration with EPR**
  - **Test Fulla (another reasonable cell)**

- **Installation, control system, cell production and field mapping:**
  - **Move out target lab once hall is open (August 5th?)**
  - **Assistant with installation**
  - **Control system /EPICS**
  - **Cell production continue at UVa/W&M with an accelerated pace of 1 cell every 1-2 weeks**
  - **Prepare for target field mapping with compensation coils/Bender magnet**
  - **Make system ready for field direction measurement**