Readiness Review Report for the $\mathbf{G}_{en}$ Polarized Target

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Cryogen Delivery

Provides LHe and LN_2 to Magnet and Refrigerator

Past and Present Issues

- Need Better LHe transfer from Buffer dewar to Magnet
  - → System will now do a "batch fill" of magnet
- He gas recovery pressure too high
  - → Will now vent to atmosphere
- N_2 gas vent pressure too high
  - → Will now vent to atmosphere

Milestones

- ◦ Design new cryogen delivery system — `JLab,Done`
- ◦ Build and leak test gas panel — `JLab,Done`
- ◦ Install gas panel, dewars, etc — `JLab,01Jun01`

Magnet & Cryostat

Provides 5T Homogeneous Magnetic Field

Past and Present Issues

- Inadequate He Gas Flow during Catastrophic Loss
- Short between Magnet and Cryostat
  - $\rightarrow$ Blocked remote interface to magnet power supply
  - $\rightarrow$ A second short would disable magnet
- Shim Coil Power Supply not Remotely Controllable
  - $\rightarrow$ New, controllable supply purchased

Milestones

∘ Redesign gas vent system	JLab,15Mar01
∘ Survey magnet/cryostat positions	JLab,15Mar01
∘ Run magnet in EEL, test for short	JLab,02Apr01
∘ Test isolated GPIB interface if short persists	JLab,02Apr01
∘ Test new Shim Coil supply	JLab/UVa,15Apr01

Microwave System

Drives enhancement of the target polarization

Past and Present Issues

- Power Supply Crashes Interrupted Data Taking
  - → Possibly caused by radiation damage
  - → Possibly caused by power spikes or other line problems
  - → PS can now be fixed locally. Spares also present
- Possibly too much power at high polarizations

Milestones

- ◦ Install adjustable attenuator in waveguide `JLab,01Mar01`
- ◦ Provide UPS/filter combo for EIO Power Supply `UVa,15Mar01`
- ◦ Position EIO Power Supply in SOS Hut `UVa,01May01`
- ◦ Fabricate longer high voltage lines to reach SOS Hut `UVa,01May01`

NMR System

Measures the Target Polarization

Past and Present Issues

- VXI-based control computer problematic
  - $\rightarrow$ Now use PC-based system similar to that in Hall B
  - $\rightarrow$ Reliable CAMAC system available as backup
- Need noise reduction on signals, especially for $^{15}ND_3$
  - $\rightarrow$ New hardware now uses shielded cables exclusively
- Need more stable NMR tune
  - $\rightarrow$ Tune varies with temperature of NMR components

Milestones

- ◦ Run PC-based system during test run in EEL `JLab/UVa,15Mar01`
- ◦ Connect NMR with new patch panels `UVa,02Apr01`
- ◦ Temperature stabilize NMR cables `UVa,01Jun01`

^{4}He Evaporation Refrigerator

Maintains the Target Material at 1K

Past and Present Issues

- Refrigerator was damaged during transport from SLAC
- Bottom heat exchanger plates not as efficient as possible

Milestones

- Repair damaged valve and tubing `UVa,Completed`
- Replace heat exchangers with proper plates `UVa,Completed`
- Repair any damaged instrumentation `UVa/JLab,25Feb01`
- Fit stepper motors to needle valves `JLab,15Mar01`

Target Insert

Holds the Target Cavities and related instruments

Past and Present Issues

- New target position added: full-size empty target cell

  $\rightarrow$ Requires new target ladder to hold extra target cell

- Target cells are radiation damaged from use in E155x

Milestones

- ◦ Design new target ladder `UVa,01Mar01`
- ◦ Fabricate ladder and new cups for all 4 inserts `UVa,01Apr01`
- ◦ Install new parts, reconnect instrumentation `UVa,01Jun01`

Tailpiece

Holds the 1K Bath, Has Beam Windows, Aligns Insert

Past and Present Issues

- Contaminants have ruined the 1998 beam windows
- Extra target position requires longer tailpiece
- New scattering angles require new alignment slot positions

Milestones

- Fabricate new, longer tailpieces `JLab,Completed`
- Fabricate new tailpiece sleeve `JLab,21Mar01`

Target Material

Source of Polarized Deuterons or Polarized Protons

Past and Present Issues

- Proton material has limited lifetime
  - $\rightarrow$ G_{en} few hours on protons. Have necessary material
- Deuteron material has indefinite life
  - $\rightarrow$ Currently have 6 target loads
  - $\rightarrow$ Can make more raw material at UVa

DAQ Software

Controls equipment, performs all measurements

Past and Present Issues

- 1998 DAQ Code worked well but not documented, complex
  - $\rightarrow$ Can adapt Hall B system that uses similar hardware
  - $\rightarrow$ Can enhance for running efficiency, user convenience

Milestones

- ◦ Get minimal system running in EEL `UVa/JLab,02Apr01`
- ◦ Get full system running in Hall C `UVa/JLab,01Jun01`

Nice to Have

- ◦ Adapt system to allow multiple independent operations `UVa`

Analysis Software

Provides final Offline Polarization Values

Past and Present Issues

- Proper analysis requires post-experiment calibrations
  - $\rightarrow$ Analysis usually shorter than that of scattering data

Milestones

- ◦ Develop online replay tools for target data `UVa,01Jul01`
- ◦ Develop offline analysis code `UVa,Completed`

Distribution of Labor

Subsystem	*Primary Party*
Cryogen Delivery	JLab
Magnet & Cryostat	JLab
Microwave System	UVa
NMR System	UVa
Target Insert	UVa
Tailpiece	JLab
Target Material	UVa
DAQ Software	UVa & JLab
Analysis Software	UVa