1 Jan. 29, 2008

Present: J. P, Karl (phone), Don Crabb (phone)
Note : These minutes were updated/corrected on 02/20/2008.

1.1 Beamline

J.P talked with Chen Yan from Hall C, and learned some information on the new slow raster. The new girder has only slow raster on it. It takes about 1.6 m space. It is 20 m away from the Hall C target. It works for 5.7 GeV (SANE) to cover 2.5 cm diameter. (We need to check if it is enough for us, up to 4.4 GeV, but with only 10 m distance?). He only built this one (no spares). It took several months development work and three months (June-August, last year) to install and commission. We need to check with Steve Wood to see if we can move it into Hall A after SANE experiment.

Chen Yan also mentioned there are some more magnets worked on by the Japanese that have a large gap, which could be used for the local beam dump if needed. We need to check with Bill Vulcan to find out more information.

1.2 Target

Don Crabb discussed with us the resources needed to install the polarized target in Hall A, and which of these resources are available.

1. Magnet and Controls : Onsite at JLab, provided by the target group. Don notes that the existing magnet has a leak, but the target group has found that it can still pump on it.

2. Microwaves : There are two tubes and one power supply at JLab and 3 tubes and 2 power supplies at UVA. However, all this equipment is not entirely compatible: UVa's tubes cannot be used with JLab's power supplies, but UVA's power supplies can be used with JLab's tubes.

3. Microwave frequency and power measurement : UVA has 2+ power measurement systems (sensors + meters). JLab has at least one, but it is incompatible with UVA's. For the frequency measurement, UVA has two complete systems and JLab one (?). UVA also has a homemade one (put together with standard units.)

4. NMR system : JLab has 4-5 Qmeter boxes. UVa has an additional 11, with 4 more that could be refurbished. We can use either the JLab or UVa computer control system. UVa system is a bit more flexible.

5. Pumping system : JLab has

   - 1 Balzer's 12,000 m^3 pump.
   - 1 Alcatel 3,000 m^3 pump.
   - 1 Alcatel 1,000 m^3 pump.
   - Various additional standard mechanical pumps (Alcatel or Lebold) in parallel.

   Most of these pumps date from the 1980s so there is possibility of breakdown. Mostly they have been very reliable, but Don recalls that the sealed motors on the Alcatel pumps have had some problems. These can be fixed by replacing the stators which are not expensive ($500-1000). The Balzers in particular are not sealed and easier to repair. However, it would probably not be practical to repair most of these pumps if they failed during the experiment, since most of them are obsolete and not supported by the manufacturers anymore.

   In an emergency, we can use the some of the spares at UVa, but Don prefers not to move them onsite since they are in use. At UVa there is 2 sets of Roots pumps. It would take 1-2 days to move them to JLab. There is also the set of pumps in Hall B which could serve as backup in an emergency. We agree that it is probably best to get the existing pumps serviced prior to the run in order to gauge how reliable they are. We should contact Alcatel to see if they will.

   The rest of the pumps are standard and should be easily replaceble.

6. Target Outer Vacuum Chamber (OVC). Any of the existing cans should be sufficient. Don points out that from safety and vacuum point of view, the smaller the windows the better. There should be two old blue SLAC cans onsite (one without windows) which we need to locate.

7. Cryogenics : We will need a 'spigot' from the liquifier close to the pivot. The magnet runs off a 500 L dewar kept near the target which is typically kept 1/2 full. The magnet dewar is batch filled at $\approx$10% and goes to $\approx$90%. The dewar feed would require few g/s constant

feed to keep the leaky Hall A pipes cold. The existing lines are very inefficient and typically require twice more coolant than was called for in the design.

J.P. points out that there is a 4K feed at the center of the Hall. This can be used to deliver 15K helium (what we need) with the proper bypass. Will need a u-tube to the dewar. There is also a liquid Nitrogen line near the target. We will need to refill the target blackbody nitrogen shield (40-50L) about once every three days during operation.

The target group usually coordinates operations with the liquifiers. Coolant will be scarce commodity during Qweak, but our needs should be a small perturbation on the Qweak draw. The only major draw is during cooldown which we'd have to coordinate with Hall C.

8. Target Inserts : There are four existing inserts at UVa, all being refurbished for the SANE run. They each have four cups. Two of them (top and bottom) are used for ammonia. The middle ones are carbon and empty. These inserts should be fine for our purposes, unless we require some new features.

9. Target Nosepiece : The existing target nose piece is probably ok, but have to make sure that the He feed tube and the He level probe are not interfering with incoming beam or scattered particles. If it needs to be replaced, this can usually done in house so it should not be a big job.

10. Ammonia : Don has lots of $^{14}NH_3$ but difficult to analyze. Also has lots of $^{15}NH_3$ that was used in previous experiments. In principle, these batches have been undergoing a long slow anneal under liquid nitrogen for years so they should be recovered from the radiation damage. We can test their max polarization prior to the experiment using the UVa lab or the setup in the EEL. However, the principle effect of radiation damage is to increase the decay constant of the polarization in beam, not to limit the maximum achievable polarization. So there is no way to really test the material for this until the experiment runs.

    For this reason, it's probably best to have fresh material. Don points out that the ammonia is not cheap, something like $30K for 100L. He will check on exact price. Once we have material, irradiating it is usually not problem. NIST has some problems with their klystron, but it should be fixed by the time we would need it.

Update from Don: The cost of ammonia is $210 for 1 liter of 15NH3, and $512 for 1 liter of 15ND3. There will be a discount for larger quantities. The cost of irradiating at the NIST MIRF Linac is $200/hour.

11. Target Platforms : We have use of two out of three of the Hall C platforms. The third is a permanent part of Hall C and can't be moved. This platform is used to hold the Roots pumps. A 12 inch diameter pipe runs from the pumps to the target. Don points out that we may be able to locate the pumps on the floor instead of on a platform. Karl offers to follow up with Bert Metzger.

12. Instrumentation : All exists at Jlab; target movers, remote control for pumps. We'll need lots of new cables run from counting house to target control in hall.