

## Minutes of the g2p/GEp collaboration meeting

Date: April 18, 2011.

**Note :** The tentative date of next collaboration meeting is between July 11-22, 2011.

1. **Bob Michaels** welcomed all to the meeting. Discussed the parameters of the upcoming readiness review. Collaboration support documents should be posted to <http://hallaweb.jlab.org/experiment/g2p/review> by April 28, 2011.
2. **Karl Slifer** gave a review of the physics motivation for E08-027: spin polarizabilities, sum rules, and structure dependent corrections in Q.E.D. E08-027 will measure  $g_2^p$  via polarized cross section difference using a polarized beam and target. Septa magnets will be used to reach low  $Q^2$ . The goal is a 7-9% systematic uncertainty on  $g_2^p$ . Kinematics have been chosen to match sister experiment EG4 in hall B, which measured  $g_1^p$ . Karl discussed the impact on physics of the out of plane correction to the scattering angle, which was revealed by **Jixie Zhang**'s monte carlo (and which was double checked by **Min Huang**). If we ignored this effect, the lowest  $Q^2$  attainable would be about 0.09 GeV<sup>2</sup>. However, the effect can be ameliorated by running the lowest energy kinematics with 2.5 T target field and moving the target 9 cm above the nominal scattering plane. In this configuration, we can reach 0.03 GeV<sup>2</sup>, which is slightly higher than the initially planned 0.02 GeV<sup>2</sup>. This would have minor impact on the physics goals of E08-027.

The new configuration does imply lower rates. This can be addressed somewhat by running with a longer target than initially planned. Bottom line is that the physics goals can still be achieved, assuming 1) we can efficiently run at 2.5 T. 2) the radiative corrections associated with a long target cell are not prohibitive and, 3) we can elevate the target to 9 cm.

UNH will be sending 2 fulltime grad students (Toby Badman, Ryan Zielinski,) 1 full-time postdoc (Jim Maxwell), and 1 fulltime faculty (Karl) for the experiment. One additional post-doc (Sarah Phillips) and an undergrad (John Donaghy) will participate in some capacity.

3. **Guy Ron** reviewed the physics motivation for E08-007, and discussed modifications to the experiment plan since the proposal. None of the new modifications are show stoppers, and the modification to the planned GEp  $Q^2$  coverage appears to be minimal. E08-007 loses its lowest  $Q^2$  point, but this was in fact not part of the original proposal, and was only added when the experiments merged. Guy will take a look at the impact of running with lower polarization for the first two energies, but it appears to be manageable. H.U.J.I. is working on several pieces in the machine shop and purchased some items which will be sent to jlab shortly. Guy has funding for students and is actively recruiting. He anticipates atleast one student dedicated to E08-007. HUJI can send a technician to help for the experiment.

4. **J.P. Chen** reviewed onsite preparations for g2p. He discussed the larger than expected modification to the scattering angle due to the target field. J.P. checked the effect for 20 degrees (GEp running) and predicts that the modification is 1/3 that for 90 degree field orientation. J.P. clarified that will not be able to run with an elevated target during 3.3 GeV, because the magnet would interfere with the straight-thru beam. About \$80K in user contributions have been made. This was the lower limit of our estimate to management, so its important to keep the contributions coming. J.P reviewed the available manpower : 7 phd students, 3 fulltime postdocs, 4 part-time postdocs, 5 active staff/faculty.
5. **Butch Dillon-Townes** reviewed beam transport for the experiments. Most of the new pieces are ready. The new movable stand for FZ2 is still being machined, but the support structure above this is on loan to us from Hall C. The AI magnet is put in series with FZ1, but not used directly for beam steering. The FZ1 magnet stand allows access to the far side of the beamline, for Ed and his crew.
6. **Tim Michalski** reviewed beamline progress. Regions 1 and 2 design is complete and material ordered. Region 3 design is complete, with final review in coming weeks. Calorimeter controller and SW upgrades are nearly complete. New electronics for the low current BPMs have been tested. New function generator for slow raster is being tested. Tim discussed the impact of the proposed changes to FZ2 and target position. Appears feasible.
7. **Joyce Miller** discussed the g2p design status. Uva is constructing the removable cartridges for the local dump and sieve slits. The cartridges will be about 15lbs of lead+tungsten. The target dewar and support electronics will not be located on the 'target' platform. Joyce discussed the manual cartridge removal system. Design is progressing nicely. The remaining items include 1) Camera/light mount, 2) Lead shield/top plate details, 3) cooling lines for low power dump 4) He bags 5) a means to elevate the target above the beamline. Currently working on the design issues related to the 9cm vertical shift in the target position.
8. **Chris Keith** reported progress on the target. Substantial repair, modification and refurbishment has been necessary to get the target ready. There will not be much room on the platform which will make target swaps and other work difficult. The new scattering chamber rotating vacuum seal works well and is leak-tight. It should be much more convenient and provide more reproducible orientations than the old method. Replacing the target 'donut' with a tee meant that a new (longer) frige and target insert were necessary. Most design is complete. Design for lifter is ongoing. Chris expects the new frige to be ready in June/July, and the new cryostat and target insert to be ready in May. The pumps have been refurbished/replaced and will be ready in June. All NMR components are available. Chris does not see any major problem with running at 2.5 T, although a microwave tube needs to be identified. He

estimates that it would take about a day to switch everything from 5.0 T to 2.5 T or vice versa.

The target magnet passed the room temperature leak test and cold shock. It was shipped from Oxford to JLab on April 15. There is some welding/cutting to be done upon arrival. Survey and alignment is scheduled during the week of April 25, subject to arrival of the magnet.

Josh remarks that the new insert will allow running with a shortened target cup, which can be pushed into the existing 3 cm cup, but towards the downstream end. The cells are made of Kel-F.

Chris identified major milestones for the target. In particular, he anticipates tests in the EEL in August, with installation in the Hall to follow on September 1. The final milestone is polarizing in the hall two weeks before the experiment starts in November.

9. **Stasche** reported on material irradiation. 3 bottles from the recent irradiation tested to about 95% polarization. Each bottle will fill about 1.25 target cups. Sane used 12 bottles (or 6 target stick swaps). Sane ran with 85 nA, and needed to swap out sticks every 3-4 days. It takes 2-3 days to freeze one bottle's worth. Two bottles can be irradiated per day. There is a three day irradiation planned for May or June. It costs 200/hour and will run 7 hours/day.

In summary, UVa expects to produce 9 bottles of usable material by the end of the summer. The combined g2p/GEp run will need about twice this. The available manpower is Stasche and Don. Collaboration assistance would be useful and appreciated.

10. **Karl Slifer** reported on rate estimates and how these fit into the existing beam allocation. He assumed that for 1.2 and 1.7 GeV we will run with 2.5 T field, and with the target elevated 9 cm above the nominal scattering plane. At 2.3 GeV the target would remain at 9 cm, but the field returned to 5 T. The remaining kinematics would place the target back in the nominal scattering plane and utilize a 5 T field.

**Ryan Zielinski** updated the rate code to include Jixie's latest prediction for the out of plane scattering angle correction.

Karl estimates that g2p and GEp need a combined 119 calendar days to reach the proposal goals. Kees pointed out that we are allocated 87 days + commissioning, which comprises the entirety of hall A running during the period between the 6 mo and 12 mo breaks. The deficit will be addressed by some combination of 1) cutting some physics 2) optimizing the overhead between g2p/GEp 3) compromising some statistical precision. He showed a table of estimated overhead items and solicited feedback from the collaboration to provide more accurate values of each item. Karl and Guy (and Doug?) will work together to turn this into a more realistic estimate and then a detailed runplan.

11. **Alexandre Camsonne** reported progress on low current BCM/BPM tests and work on tungstun calorimeter. BCM tests are planned in the hall while BPM test are done

in the north linac. BPM shows good results upto 500nA and shows some signal at 50nA. BCM test are currently undergoing and he is looking at the data. Preliminary results looks encouraging. The s/w for running the calorimeter will be ready by Aug. **Pengjia Zhu** is working on the re-analysis of tungsten calorimeter data from LEDEX expt. He mentioned that we may have to run longer than previous experiment to get 1% accuracy at 50nA at 3.3 GeV - about 16mins

12. **Jixie Zhang** reported on the Geant4 simulation for g2p/GEp. Jixie reviewed the magnet field properties, and discussed the effect the field has on the scattering plane of low momentum electrons. The code is available for checkout from <https://jlabsvn.jlab.org/svnroot/alla/groups/g2p/HRSMC>. The montecarlo is close to being usable for analysis, but Jixie also has a long list of upgrades planned. He also showed predictions for the expected elastic rates. J.P. pointed out that this implies we will have to run a no septa 1.1 GeV, 12.5 degree optics run, since the rates are otherwise too low at 12.5 degrees.

Jixie reports that **Chao Gu** is helping to incorporate QFS, EPC and P. Bosted's model into Jixie's simulation. **Min Huang** is working on SNAKE and MUDIFI to get the HRS transportation package. **Peng-Jia Zhu** is working on BCM/BPMs, becoming a target expert, and Geant 4 simulations.

13. **Kalyan Allada** reported on the 3rd arm progress. Kalyan has evaluated two possible solutions: 1) electron detector at 45 deg on beam left, 2) proton detection at 74 deg on beam left. Option 1 has very bad rates except for 1.1 GeV where it may be feasible. Kalyan is focusing on option 2. He finds that it could provide a relative measurement for 5% accuracy in one shift or less for all settings. This is very good compared to previous experiments attempts at similar luminosity monitors. He plans to use the SANE forward tracker as a dE plane. The E plane will be from the DVCS proton array counters. The dimensions of the whole package would be about 40 cm by 20 cm, positioned at 74 degrees, 1.5 m from the center of the target ( can has 57 cm radius, so about 1 m from the outer can). Ed points out this may not be possible due to location of stairs, but Kalyan will check with Al about the possible obstructions. **Chao Gu** is assisting him.
14. **Min Huang** reported on using the SNAKE model for particle passage through the target-Septa-HRS system. She is using the SANE target field map. She verified Jixie's prediction for the large modification to the scattering angle. Min also evaluated the acceptance with the newest configuration and finds greater than 4 msr for all settings. However, Vince and J.P. pointed out that after cuts, the usable acceptance will probably be about 3.5 msr (Prex value).

We discussed preparation for the readiness review. In particular, the charge to the review committee:

1. **Will all equipment be here on time?** Ed says yes. Josh has some concern for some target components. Doug is concerned about the cryo u-tube for delivery of 4K supply to hall. We have enough material to start, but UVa will plan on identifying 9 additional bottles of material sometime before November. We need to secure the 70 GHz microwave tube to be used at 2.5 T. Probably from Duke. A new unit would cost about \$70 K. There are 70 GHz transmission lines for microwaves available at UVa. The other items needed are a thermistor mount for power measurement and a harmonic mixer (not cheap). All the NMR components will work at both fields.

The third arm is not critical so will not be reviewed. Tim may need some power supplies, otherwise all beamline components are good.

2. **Have all jobs been identified/defined adequately?** Al is concerned about the LCW (low conductivity water) supply to the hall, since there are 3 new magnets and 2 new power supplies to feed. He is concerned that there may not be room to work on the target platform. We will need to coordinate well with the alignment support group. Ed urges a swift lockdown of experiment parameters. He would like a hard deadline (Sept 1) for considering the target late. Chris has agreed to this milestone.
3. **Milestones:** Chris has established target milestones. Ed has Hall milestones. Tim has established beamline milestones. Each should be aware of the other, but they remain independent.
4. **Manpower :** The collaboration is well represented. Many are already onsite, with many more to arrive this summer. Pengxia has been identified as the collaboration liaison on BCM/BPMs, which addresses a concern of Arne F. Tim will check with Arne to make sure the accelerator has enough manpower.
5. **Necessary ancillary tests/monitoring :** Safety documentation. We will modify the target docs used in SANE. We need to outline all the documents that we will eventually provide.
6. **Is the scheduled beam time adequate?** Karl and Guy (and Doug and JP?) will work to polish the existing runplan, then send out to the collaboration for comment.
7. **Documentation :** Doug points out the BigFamily documentation from a previous review. We will aim to have a short document that outlines the experiments, with full details in the talks. Each expert will provide a paragraph or two which can then be incorporated into a coherent document (Karl?). Here is the rough outline:

- Physics : Karl, Guy, J.P. will write.
- Beamline changes : Tim and Butch will write.

- Dump/Septa/Pivot : Al will write.
- Safety : Each section should discuss the safety considerations of the particular subsystem.
- Manpower.
- Beamtime request.