Jefferson Lab
Thomas Jefferson National Accelerator Facility
Exploring the Nature of Matter

3 January 2013

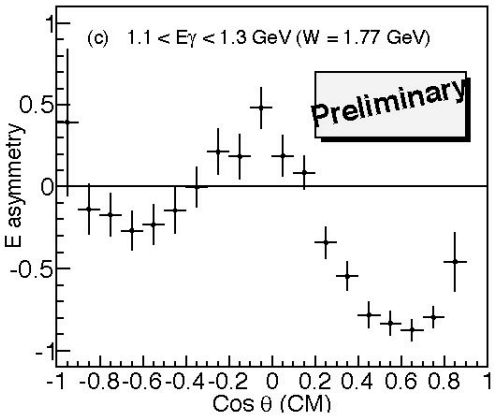
Dear Colleagues:

As the year 2012 has comes to a close it is fitting to take a look back at some of the events we all have experienced together.

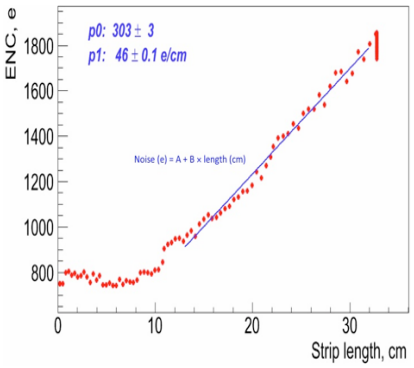
I like to begin by welcoming new members to the CLAS/CLAS12 collaboration as well as the new members to the HPS and PCR collaborations. They have made the Hall B programs stronger and more diverse. The CLAS collaboration continued with a good harvest of published papers in refereed journals, including 8 CLAS collaboration publications (including one Comment), four papers involving higher-level analysis by individuals or small groups, and one NIM paper. Several more papers have been submitted for publication. The publications span the physics spectrum from hadron spectroscopy to deeply virtual processes. Another measure of success is the over 125 conference talks of which 77 were invited talks. It is also good to see that many talks were given by graduate students and by postdocs, although we had significantly fewer APS/DNP contributions than in previous years. We also clearly see a trend of an increasing percentage of CLAS12 related talks.

The 6 GeV program:

2012 marked the end of the experimental program in the 6 GeV era, that we completed with the HD-Ice experiment (G14 run group). Together with the series of previous photon runs, G14 has completed the program to search for undiscovered excited states of both the proton and neutron. The figure shows the angular dependence of the longitudinal double polarization asymmetry E in a single energy bin and with just 10% of the full statistics for the process $\gamma D \rightarrow p\pi^-(p_s)$. Of course, a large number of analyses of data taken by earlier run groups continue to be at the center of the 6 GeV scientific program, and guarantees that many of us, especially graduate students and postdocs are kept busy with harvesting great physics in years to come.



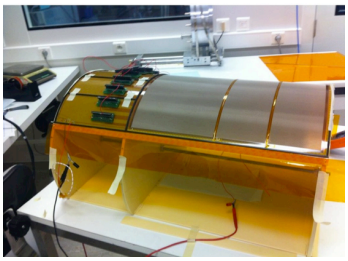
Another experiment that took data during G14 is the HPS experiment, a search for heavy photons. While this group had hoped to get some run with electron beam, the delay in getting the HDIce target running with a highly polarized HD sample did not allow that to take place. However, the experiment took important data in photon operation that allowed the collaboration to get the experiment conditionally approved (C1) with A rating at PAC39. The Hall B DAQ group and the Fast Electronics group did an excellent job in taking advantage of the HPS equipment to test many of the electronics boards needed for CLAS12. Other groups took advantage of the ongoing G14 run to test new equipment for CLAS12, e.g. an SVT double layer module and a prototype of the Forward Tagger calorimeter. The figure to the left shows noise measurements of the SVT full chain test. The noise level along the full strip length of one SVT module remains below the design limit of $\sigma < 2{,}000$ electrons. This is to be compared with the 24,000 electrons a MIP releases passing through one layer.



The Hall B technical team deserves much of the credit for keeping Hall B in excellent conditions and ready for experimentation. They have done a great job in maintaining CLAS detectors and carrying out design and complex installation tasks for the G14 experiment and other, and have done this in the most professional way.

The 12 GeV Upgrade:

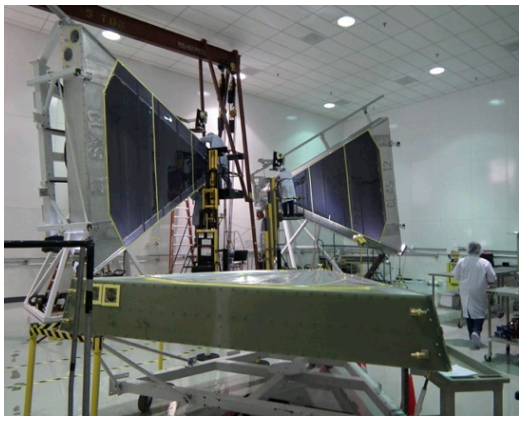
With 19 fully approved experiments to which the PAC assigned 1,480 days of beam time, and additional four C1 approved experiments requesting 510 days of beam time, the Hall B collaborations laid the foundation for a robust and very exciting science program. Several CLAS12 approved experiments require additions to the base equipment, such as polarized targets, micromegas for improved charged particle tracking, a detector for neutrons at large scattering angles, and a forward tagging system. Several groups in the collaboration have joined into initiatives to add equipment to accommodate these additional requirements. The construction of the barrel micromegas tracker is now underway at IRFU/CEA (see

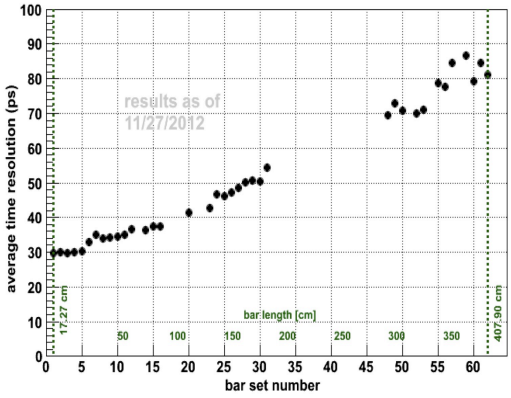


figure, showing 1/3 of one full layer). The CND is under construction at Orsay, involving several European groups, and prototyping of components for the Forward Tagger is in the final stage coordinated by the INFN/Genova group. Funding for these important additions to CLAS12 has been largely secured from European and US sources. These initiatives also reflect the strong involvement of international groups into defining the future directions of research with CLAS12.

Moreover, the detection of high-energy charged kaons in CLAS12 is currently insufficient to carry out an essential part of the physics program that needs excellent kaon identification. The current plan is to equip at least one CLAS12 sector with a RICH detector. The INFN groups at Frascati and at Ferrara have taken the lead in the design and prototyping effort, and extensive beam tests have been carried out at CERN.

Thanks to the strong commitment of the collaboration, and the engineers and designers the Hall B upgrade with the CLAS12 base equipment had a very successful year 2012, as was demonstrated in the recently completed DOE Lehman review that resulted in no recommendations for Hall B. All detector systems are now in construction. The drift chamber R2 stringing has been completed at ODU, and ISU is well advanced with stringing sector #3 and #4 of R1. At JLab #3 and #4 of R3 are being strung in parallel (figure, one sector R2 in the foreground). Four of the PCAL sectors have been completely stacked, and all have been cosmic ray tested and calibrated, the last one with the new fADC bords.

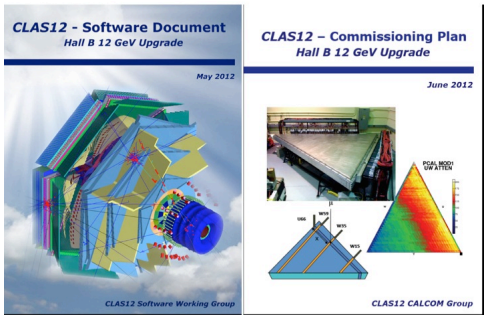




The assembly of the FTOF paddles at USC is well advanced. The time resolution exceeds the design specifications, with the shortest bars (< 50cm) reaching less than 35psec, and the longest ones (407 cm) achieving better than 90psec (see figure). The CLAS TOF panel 1 counters have been removed from the Hall, and are now being tested and prepared refurbishment. Most of the components for the CTOF detector are on order, and have been received. Detector assembly is planned to begin early 2013. Mirror fabrication for the HTCC is well underway and the large containment vessel is on order.

Besides this great progress on the detector construction, we also took important steps to recover from a major set back that occurred as a result of terminating the two contracts for the superconducting solenoid and torus magnet, with our vendor in California. The good news is that the solenoid magnet has been rebid and the contract has been awarded last month to Everson-Tesla, a US-UK cooperation with experience in the design and construction of superconducting magnets of similar size and complexity. The new contract calls for a two years construction time until the end of 2014. The Torus magnet is a more challenging project because of its very large size and the requirements coming from large acceptance at small polar angles, which results is very thin coils and mechanical stability challenges. Past experience has shown that very few vendors have the capabilities to build such a complicated magnet. The current plan for the Torus calls for the winding of the coils to be done at Fermilab, and a corresponding contract was put in place thanks to the effort

of Latifa Elouadrhiri, the project manager for the CLAS12 project. The design and construction of the other components, e.g. the cryostat, cryogenics, control, etc. will be done at JLab. The superconducting magnets are the highest priority of the Hall B 12GeV upgrade. With very strong support by management a team was put in place and Dave Kashy assigned to lead the Torus design and construction at JLab. The engineering and design work has already made significant progress. In order to keep the detector project on track Bob Miller was assigned to lead the detector construction and installation effort.



The past year also saw progress in the software development for CLAS12. We passed the first software review with outside reviewers where the new offline software framework CLARA was presented. Another major effort went into developing the tools that will allow the collaboration to calibrate and commission all CLAS12 detector components in an organized fashion. These efforts resulted in two documents that were released in 2012. (see figure).

Looking forward to 2013:

As 2012 has been the year of getting ready to make CLAS12 a reality, 2013 is poised to be the year where major components of CLAS12 detectors will be ready for installation in Hall B. In order for this to happen the Hall needed first to be cleared from all equipment that will not be used in the 12 GeV era. This effort will be completed in January 2013 with the removal of the north clamshell. A major milestone was passed with the completion of the decommissioning and disassembly of the Torus magnet. The last of the six magnet coils was taken down just before the holiday break (figure).

While with the removal of the CLAS detector an era has come to an end, the dawn of the new 12GeV era has already begun. The first activity in the Hall will be to prepare the forward carriage and the space frame for the additional requirements that come with the new detector and magnet systems that will be installed. Once the forward carriage has been modified to hold the additional detector weights, the first PCAL modules will be installed, followed by the FTOF panels and the refurbished LTCCs.

Let us continue and work together to make sure 2013 will be another great year of physics coming from CLAS experiments, and when the year when the first pieces of equipment for 12 GeV will be installed in Hall B and ready for commissioning!

I wish you all a peaceful and successful year 2013!

Volker Burkert