EIC Detector R&D Progress Report:
from_10/1/2013_ **to**_6/25/2014_

Project Name: DIRC-based PID for the EIC Central Detector

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Past

What was planned for this period?

There were several key items for year 3.
First, our previous ODU postdoc Helena had moved to DC at the end of year 2, and we needed to hire a replacement and continue the simulation work.
Second, the space in the refurbished test lab at JLab was becoming available and we could set up the high-B-field sensor test facility, initially using the smaller 5T FROST solenoid (which was cheaper to set up and operate).
Third, were going to design, build, and test in-beam an advanced three-layer lens with high index of refraction.
Fourth, we were going to obtain a fused-silica expansion volume for the prototype.
And finally, we were going to present results on integration with the EIC detector(s).

What was achieved?

We essentially achieve all our goals for this period.
A new postdoc, Greg Kalicy, has been hired. HE started at ODU on May 1. He did his PhD at GSI working on the PANDA barrel DIRC, so came well prepared. To boost the simulation effort, Roman Dzhygadlo from GSI joined the project (unfunded) to help with the GEANT simulations. Greg and Roman have already started working on reproducing Helena's proof-of-concept result using both ray-tracing and GEANT.
The high-B-field sensor test facility has been set up. In addition to the two single anode MCP-PMTs that we ordered from the Russian company Katod (and which have not yet been delivered), we managed (so far) to obtain five MCP-PMTs (each typically a $10-20k item) on loan from Photonis and Photek for only the cost of shipping. These sensors have now been delivered. The first measurements are planned for the last quarter of year 3.
The three-layer lens has been designed, ordered and will be delivered in July in time for the test beam at GSI in August.
The original plan to procure a simple EV for the prototype has been fulfilled, as two 30-cm-long fused-silica EVs with different top angles have been procured by GSI and will be provided for out tests at no cost. However, in order to take advantage of the advances in the lens design, the plan is now to procure an expansion volume in year 5 that is optimized for the final lens (which will be built in year 4).
Lastly, some progress on integration was, as usual, made by the CUA summer students. An important additional step here is the extension of the simulations from ray-tracing to GEANT, which, as a side effect, also will create a code base for the general detector simulations.

What was not achieved, why not, and what will be done to correct?

There were some adjustments to the original plans, but they were all essentially positive. Even the changeover of postdocs went smoothly and resulted in the hiring of a person more experienced in DIRC R&D. Other adjustments were mostly guided by the conclusions obtained from the R&D, and emerging opportunities to take advantage of various pieces of hardware in the project with limited additional cost (e.g. through synergies with work at GSI or contacts with sensor manufacturers). In the changeover period, postdoc funds were used to strengthen the high-B-field facility setup by temporarily assigning another ODU postdoc (K. Park) to work on the project. This allowed us to remain on track despite some delays in the availability of floor space in the refurbished test lab.

Future

What is planned for the next funding cycle and beyond? How, if at all, is this planning different from the original plan?

An updated proposal has been submitted, but to summarize, we want to extend the proposal by one more year (year 5) to build a prototype that can incorporate both our successful development of advanced optics and a an expansion volume that has been optimized for these new lenses. We have also been able to expand the scope of the high-B-field sensor tests at little additional cost. We hope that as interest grows, this trend can continue.

What are critical issues?

The critical issue is the year 5 extension, which would allow us to tie together all the various aspects of the R&D.

Additional information: