

JSA Report of Jixie Zhang

Academic year of 2008-2009

I am very grateful for the support of JSA in 2008 to 2009 academic year. Here is a brief description of my research within that period. I am working with Jlab experiment E03-012, Barely off-shell Nuclear Structure (BoNuS). My research always includes two parts: simulation and the $D(e, e' \pi^- P_{\text{CLAS}} P_{\text{RTPC}})$ analysis.

For the simulation part, in November of 2008 I finally found out the proper parameters for the gsim post processing (GPP) for BoNuS simulation. One month later I found a practicable $D(e, e' \pi^- P_{\text{CLAS}} P_{\text{RTPC}})$ event generator, named final state generator (FSGEN), newly written by Stepan Stepanyan and gave up writing my own event generator, which was designed in the same manner as FSGEN. Then I debugged, tested and upgraded FSGEN. In February of 09 I discovered a good set of parameters for the FSGEN which will generate events similar to what we have detected in the BoNuS experiment. This means the developing era of BoNuS simulation was completed. We have stridden into the era of production. During the following months I submitted huge number of simulation jobs to Jlab batch farm system, simulating both inclusive events and exclusive events for BoNuS group. In around August 2009 I eventually completed the acceptance and efficiency study for both RTPC and CLAS detector of BoNuS experiment.

Now it is the turn to talk about my achievements in the data analysis part. Since there was a computer operator system switch in Jlab and the software we are using was not the latest version, I reinstalled all necessary software, especially the CLAS software (release-4-15 with my upgrades) for BoNuS group. Then I recook the data, and redo the quality checks for all data set. Later on I found out the Cherenkov Counter (CC) in our data was not calibrated, and there is not any program exist for doing this using the cooked production. Therefore I developed a program to do the CC TDC calibration using h10 ntuple. The CC ADC calibration need to be done as well but currently it is still under processing by the CC expert. In the mean while I found bugs in the CC reconstruction code of CLAS software. These bugs affect the CC timing information for all the experiments from 2005 till now. Since CC timing information was not frequently used, it affects only those analyses which have used cc timing information. I fixed these bugs in our CLAS software. In the mean while I reported and discussed these bugs with CC experts and let them fix it in the current CLAS software. In the near future, once the CC ADC calibration is finished, we will cook the data again.

I have also huge progress for my analysis. After comparing the acceptance and real statistic for various sets of binning carefully, I finalized the binning for $D(e, e' \pi^- P_{\text{CLAS}})P$ and $D(e, e' \pi^- P_{\text{RTPC}})P$ analysis. I have also finalized the exclusive cut which can select

good exclusive events out. I completed the background subtraction, target pressure study, luminosity study. With the acceptance correction ready, I finally have the cross section of $D(e,e'\pi^-P_{CLAS})P$ and $D(e,e'\pi^-P_{RTPC})P$ in hand. Currently there was only about 800 data points for the neutron in MAID databases. BoNuS can provide around 3300 data points to them. There are still a few things to do before publishing our result, for example the radiative correction, final state interaction (FSI) correction and systematic uncertainty study.

I am heartily grateful to all the support from JSA and to my advisor and BoNuS collaborators.

Talks and Publications

- “Analysis status of Barely off-shell Nuclear Structure (BoNuS)”, meeting of the Deep Process Working Group (DPWG), CLAS Collaboration meeting, Jefferson Lab, June 09-11, 2009. http://www.jlab.org/~jixie/talks/Jixie_DPWG_JUNE09.pdf
- “Exclusive π^- Electro-production from the Deuterium in the Resonance Region”, 2008 Annual Fall Meeting of the APS Division of Nuclear Physics, October 23-26, 2008. http://absimage.aps.org/image/MWS_DNP08-2008-000179.pdf