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Advisor, Gail Dodge

Research Publication *BoNus: Development and Use of  
a Radial TPC Using Cylindrical GEMs* is available at:  
<http://www.jsallc.org/IF/Reports/2007ZhangPub.pdf>

Poster is available at:  
<http://www.jsallc.org/IF/Reports/2007ZhangPoster.pdf>

# JSA Report of Jixie Zhang

Academic year of 2007 - 2008

I am very grateful for the support of JSA. In 2007-2008 I have been focused on 2 things. One is upgrading the simulation, reconstruction and analysis software; the other is analyzing  $D(e, e' \pi^- p_s p)$  channel for the real data.

I have huge progress for simulation. Let me explain the simulation of BoNuS experiment. A regular CLAS experiment uses a program named 'gsim' to simulate the CLAS detector and uses 'user\_ana' to reconstruct the simulation data. But we have also used a NEW Radial Time projection Chamber (RTPC) in our experiment. I have developed a Geant4 simulation program name 'BONUS' from 2005. But it can not be merged into 'gsim' since 'gsim' was based on geant3. I don't want to abandon 'BONUS' and rewrite it using geant3 since it will take months even longer to do that. So my solution is that use BONUS as an input to 'gsim'. Therefore I need to let 'BONUS' create an input file which 'gsim' can recognize; then modify 'gsim' to take care of the primary particles comes out from RTPC and also the hits created by BONUS; finally I need to modify 'user\_ana' to take care all the changes from 'gsim'.

In February 2008 I finished all the above changing. Since RTPC reconstruction packages has been upgrade, I have also developed a new RTPC Proton energy loss correction package using the updated RTPC reconstruction. Meanwhile I developed the energy loss correction packages for CLAS particles, including electron, pions, proton and kaons. I have also generated a table of "Radiation Length Number" for scattered electron going through RTPC. The things left behind were event generator and gsim post processing. These 2 jobs were not finished until Nov 2008. I will explain them in the report of 2008-2009.

In data analyses part, I have done the following.

1. I have updated the scattered electron identification, created new routines for pions, kaons and proton identification.
2. Scintillator timing calibration for large angle paddles (index>22)
3. Create "Good or BAD RUN List" using quality checks
4. I have done the preliminary analyses to the  $D(e, e' \pi^- p_s p)$  channel and gave a talk at DNP 2007 meeting.

Based on my productive analyses and efforts, I won the 1st prize in the 2008 Jefferson Lab Users Group Poster Competition. I would like to express my thankfulness again to all the support from JSA and to my advisor and collaborators.

## Talks, Posters and Publications

- 10/2007 "Exclusive  $\pi^-$  Production from the Deuterium", DNP 07. See the abstract at [http://absimage.aps.org/image/MWS\\_DNP07-2007-000255.pdf](http://absimage.aps.org/image/MWS_DNP07-2007-000255.pdf)
- 06/2008 "Exclusive  $\pi^-$  Electro-production from the Deuterium in the Resonance Region", 2008 Jefferson Lab Users Group Poster Competition. See the poster at [http://www.jlab.org/~jixie/talks/poster\\_48X36\\_June08.pdf](http://www.jlab.org/~jixie/talks/poster_48X36_June08.pdf)
- H. Fenker, *et al.*, "[Development and use of a radial TPC using cylindrical GEMs](#)", Nuclear Instruments and Methods in Physics Research Section A, **592**, 2008 273-286

Abstract Submitted  
for the DNP07 Meeting of  
The American Physical Society

Sorting Category: 14a. (E)

**The Double Spin Asymmetry for Exclusive  $\pi^+$  Production With CLAS** JOSHUA PIERCE, University of Virginia, CLAS COLLABORATION — The eg1b run was conducted using CLAS at Jefferson Lab using a 1.6 GeV - 5.6 GeV longitudinally polarized electron beam and polarized nuclear targets (composed of  $\text{NH}_3$  and  $\text{ND}_3$ ). This analysis is of the double spin asymmetry  $A_{et}$  in the exclusive production of positive pions from a polarized proton ( $ep \rightarrow e\pi^+n$ ). The double spin asymmetry was measured as a function of the four kinematic variables  $W$ ,  $Q^2$ ,  $\cos\theta^*$  (the angle between the direction of the virtual photon and the produced pion), and  $\phi^*$  (the angle between the lepton interaction plane and the hadron interaction plane). The value of this asymmetry can be used to determine the spin structure of the resonances. A brief description of the experimental setup will be given, and preliminary results will be shown.

- Prefer Oral Session  
 Prefer Poster Session

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Date submitted: 02 Jul 2007

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