I would like to thank JSA/JLab Graduate Fellowship Program Committee for awarding me this fellowship again. During this year 2015-2016, I continued working on the analysis of Hall A E08-027 $g_2^p$ experiment.

1 JLab E08-027 $g_2^p$ Experiment

JLab has been at the forefront of a program to measure the spin-dependent structure functions $g_1^n$, $g_1^p$, $g_2^n$ and their moments over a wide kinematic ranges. But $g_2^p$ data is absent at low and moderate $Q^2$. The JLab Hall A E08-027 $g_2^p$ experiment aims to perform a high precision measurement of the proton structure function $g_2$ in the low $Q^2$ region ($0.02 < Q^2 < 0.2$ GeV$^2$) for the first time. The measured data will provide an unambiguous benchmark test of $\chi$PT calculations and examine the Burkhardt-Cottingham sum rule at low $Q^2$. The experimental data was taken in 2012.

During this year, I focused on understanding the experimental yields drift issue. For the $g_2^p$ experiment, we did the measurements with 5 beam energy settings. And there were more than 10 momentum settings for each beam energy. I conducted a detailed study about the yields spread for the same kinematic setting and found that there were 7% production data had yields spread larger than 3.5%. This is the so called yields drift issue, which should not be exist if all the experimental conditions were stable and identical. To understand this drift issue, I simulated the beam dependent acceptance and yields and compare them with data. With the help of raster cut and simulation, about half of the drift data could be understood. This yields study could also help check and understand other subsystem analysis, especially the Beam Position Monitors (BPMs). Beam position is very important for our cross section measurement since it contributes to the scattering angle directly. Several problems about
BPMs have been found and studied.

The preliminary physics asymmetry and cross section results of this experiment are expected to be extracted out in the following year. With the support of fellowship travel grant, I presented a talk about $g_2^p$ experiment in Baryon 2016 in Florida.

2 Talks
