3 D Nucleon Tomography Workshop Report

March 15-17, 2017

Jefferson Lab, Newport News Virginia

Latifa Elouadrhiri and David Richards for the organizing committee

Workshop Overview

The 3D Nucleon Tomography Workshop took place at Jefferson Lab from March 15 through March 17, 2017. The workshop began on Wednesday morning, and finished at lunchtime on Friday. Participation to the workshop was by invitation to members of the computational, experimental and theoretical communities, but those interested in participation were encouraged to contact members of the organizing committee. The workshop was a great success. Many of the leaders in the field attended the workshop, and in total we had about 50 participants, representing theory, phenomenology, experiment and computing. We made sure that there was good representation among young scientists, both post-docs and graduate students. We designed an agenda to allow ample discussions after each of the invited presentations. We also allowed time on Friday for new ideas to be presented, with 4 contributions to that session. The rest of Friday morning was dedicated to discussion of the path forward so as to facilitate bringing the communities of theorists, experimentalists and computer scientists together to ensure the greatest physics outcomes. More details of the workshop can be found under www.jlab.org/conferences/3Dmodeling.

Organizing Committee

Amber Boehnlein, Jefferson Lab
Latifa Elouadrhiri, Jefferson Lab
David Richards, Jefferson Lab
Franck Sabatie, CEA Saclay
Peter Schweitzer, University of Connecticut

Summary and Goals of the workshop:

The discovery of Generalized Parton Distributions (GPDs) and more recently Transverse-Momentum-Dpendent Distributions (TMDs) has opened the window on a three-dimensional imaging of the nucleon, going far beyond the one dimensional, longitudinal structure probed in Deep-Inelastic Scattering, and the transverse structure encoded in the different form factors. The three-dimensional imaging of the valence quarks is a cornerstone of the current worldwide experimental programs, and a future proposed EIC will extend this imaging to sea quarks and gluons. This experimental effort is complemented by theoretical advances through lattice QCD calculations and through QCD-inspired pictures of the nucleon.

However, fully capitalizing on these experimental and theoretical efforts demands a structured connection between theory, experiment and phenomenology, and one capable of handling the increasing data and computational challenges that such a connection will entail. During this workshop, we focused on detailing the requirements for an analysis framework. We examine the theoretical and experimental components that need to be incorporated, and the approaches to the computational challenges that these requirements will entail.

Result of the workshop

The outcome of the workshop will be a white paper, and the establishment of collaborative effort aimed at tackling these challenges, and ensuring that the resultant framework can be applied across the emerging nuclear experimental and theoretical programs, including at a future EIC. The paper will address three specific topics. Firstly, the analysis methodology and the data/analysis requirements at current and upcoming experiments, including BNL, CERN, GSI, JLab and a future EIC. Secondly, the theoretical and phenomenological requirements, and how those requirements can be integrated within an analysis framework. Finally, the requirements for future experimental extraction and validation, in particular through the incorporation of Monte Carlo simulation components.

A plan for the white paper has already been circulated amongst the participants, with a request for presenters to submit two to four pages summarizing their contributions by early May. These contributions will form the basis of the White Paper which we anticipate circulating in draft form two months thereafter.