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## Research Interest

Particle and nuclear physics:

- ◆ Dynamics of strongly interacting particles, hadrons, and their elementary constituents, quarks and gluons, via the study of the hadronization and fragmentation processes that probe the dynamics of quark propagation and hadron formation in cold nuclear matter, and the color transparency phenomenon; that is, the formation and evolution of small size configurations to regular hadrons.
- ◆ Nucleon structure via the study of the anti-quark asymmetry, and the sea-quark Sivers functions on the unpolarized and polarized Drell-Yan process, respectively, in addition to the poorly known gluon/Twist-3 transverse momentum distributions via the  $J/\Psi$  production, and some medium stimulated effects such as the quark energy loss and the “EMC” effect.

## Employment History

- ◆ August 2014 – Present                      Assistant Professor Bridged Position, Experimental Medium Energy Physics Group, Department of Physics & Astronomy, Mississippi State University, and Jefferson Lab.
- ◆ December 2013 – August 2014            Post-doctoral Research Associate, Experimental Nuclear Physics Group, Department of Physics, Old Dominion University jointly with Jefferson Lab.  
**Advisor:** Prof. Larry B. Weinstein
- ◆ May 2009 – May 2013                      Post-doctoral Research Associate, Experimental Nuclear Physics Group, Department of Physics & Astronomy, Rutgers, The State of New Jersey University.  
**Advisor:** Prof. Ronald Gilman
- ◆ July 2008 – January 2009                Visiting Research Scholar, Experimental Nuclear Physics Group, Department of Physics & Astronomy, Rutgers, The State of New Jersey University.  
**Advisor:** Prof. Ronald Gilman
- ◆ September 2003-December 2007        Research Assistant, Medium Energy Physics Group, Physics Division, Argonne National Laboratory.  
**PhD Advisor:** Dr. Kawtar Hafidi

## Education

- ◆ June 2008                      PhD in Experimental Physics,  
Mohammed V University, Rabat, Morocco.
- ◆ June 2003                      Master in High Energy Physics,  
Mohammed V University, Rabat, Morocco.

- ◆ June 1999 Bachelor in Nuclear Physics,  
Abdelmalek Essaadi University, Tetouan, Morocco.

### Teaching Experience:

- ◆ Teaching Nuclear Physics; PH-8613, in Fall 2018.
- ◆ Taught Intermediate Mechanics II; PH-4223/6223, in Spring 2018.
- ◆ Taught Intermediate Mechanics I; PH-4213/6213, in Fall 2017.
- ◆ Taught Calculus-based Physics course, Physics III; PH-2233, in Fall 2016.
- ◆ Taught Intermediate Mechanics II; PH-4223/6223, in Spring 2016.
- ◆ Taught Intermediate Mechanics I; PH-4213/6213, in Fall 2015.
- ◆ Taught Nuclear Physics; PH-8613, in Fall 2014.

### Ongoing Research Projects:

- ◆ I am currently involved in the following projects:
  - ✓ Studying the hadronization of the  $\Lambda^0$  hyperon in the current and spectator fragmentation regions in addition to the fracture functions using the data-sets of the electroproduction experiments, E02-110 & E02-104 (run-group EG2), taken in CLAS/Hall-B at Jefferson Lab.
  - ✓ Developing and maintaining the calibration and monitoring suites for the CLAS12 drift chambers housed in Hall-B, Jefferson Lab. In addition, our group built the data explorer suite to check and monitor the operation and the quality of data recorded on various CLAS12 sub-detectors' variables and/or channels. We also initiated an effort to develop a multi-threading C++/ROOT-based analysis framework for the newly accumulated CLAS12 data-sets.
  - ✓ Contributing to the ongoing analyses of CLAS/EG6 run-group that aim to investigate the coherent and incoherent production channels off  $^4\text{He}$ . The results of the deeply virtual Compton scattering off  $^4\text{He}$  have been published in Fall 2017, and the other analysis channels are in mature stage and will be published soon.
  - ✓ Preparing for my two 12 GeV CLAS12 experiments, color transparency and color propagation (hadronization/fragmentation study), that are scheduled to partially run in Spring and Fall of 2019.
  - ✓ SeaQuest E906 and E1039 unpolarized and polarized Drell-Yan experiments that seek to determine the sea anti-quark asymmetry,  $\bar{d}/\bar{u}$ , and the sea-quark Sivers functions in addition to the poorly known gluon/Twist-3 transverse momentum distributions using the  $J/\Psi$  production, respectively. Both experiments study the properties of di-muons produced in the Drell-Yan process using a 120 GeV proton beam extracted from the Fermilab main injector. In addition, both experiment offer the possibility to study some medium stimulated effects such as the quark energy loss in cold nuclear matter and the EMC effect.
  - ✓ Fine-tuned the deuteron analysis of the E03-006 data-set (EG4 run-group) until it was published in Spring 2018. This measurement was carried out in Hall-B at Jefferson Lab to study the helicity-dependent inclusive cross section differences for

proton and deuteron at low momentum transfer, using a longitudinally polarized electron beams and targets. The extracted deuteron and proton spin structure functions will be used to evaluate the neutron structure functions, and hence, shed more light on the nucleon structure function in the region of quark-confinement as well in the transition region between hadronic and partonic degrees of freedom.

- ✓ Completed the shared task of developing and debugging the tracking software for the upcoming [BoNuS12](#) ("Barely off-shell Nucleon Structure") experiment.

### **Work Services:**

- ✓ Member-at-Large at the executive committee of the SouthEastern Section of the American Physical Society (SESAPS), effective Jan. 2019.
- ✓ Outreach Director at the Jefferson Lab Users Group Board of Directors since June 2017.
- ✓ Chair of the colloquium committee at the MSU Physics & Astronomy department since August 2015. Joined the committee in August 2014.
- ✓ Secretary of the CLAS speakers committee (CSC) that supervises and promotes the broad dissemination of CLAS results to the scientific community since January 2015.
- ✓ Representative of the nuclear physics working group (NPWG) in CSC since March 2014.
- ✓ Representative of the MSU medium energy group in the institutional board of the Electron-Ion Collider users group.
- ✓ Member of the standing review committee of series of CLAS data-mining analyses using the EG2 data-sets.
- ✓ Chaired the search committee to elect the current chair of the CLAS NPWG.
- ✓ Chaired the review committee of new CLAS12 proposal to the recent Jefferson Lab program advisory committee, PAC-44 and PAC-45.
- ✓ Was a member of the review committee of the CLAS analysis "A measurement of the nuclear dependence of hadronization of neutral kaons" for about two years.
- ✓ Worked closely with two E906 graduate students on the drift chamber's commissioning, calibration and construction.
- ✓ Supervised two graduate students from Rutgers university, Yawei Zhang, in one of his thesis projects related to the  $^3\text{He}$  polarized target's analysis, and, Arun Tadeballi, throughout E906 summer and thesis projects.
- ✓ Mentored undergraduate students in their summer projects at Argonne national lab. and Fermilab, 2006 and 2010-2012.

### **Professional Organizations and Activities**

- ◆ American Physical Society (APS), Southeastern Section of APS (SESAPS), Division of Nuclear Physics (DNP), Topical Group on Hadronic Physics (GHP) and Division of Particles & Fields (DPF).
- ◆ Hall-B & Hall-A Collaborations, JLab.
- ◆ E906/SeaQuest & E1039/Polarized Drell-Yan Collaborations, Fermilab.

- ◆ Association of Women in Science.
- ◆ Women Club at Mississippi State University.
- ◆ International Women’s Leadership Association, IWLA.

## Awards

- ◆ Argonne National Lab, “Graduate Fellowship” (2003-2008).
- ◆ JLab/MSU, “Assistant Professor Bridge Appointment” (2014-2019).
- ◆ Hall-B/JLab, “Memorandum Of Understanding for Full Membership of MSU on the CLAS Collaboration” (2014-2020).
- ◆ CLAS Collaboration, Hall-B/JLab, “Full Membership” granted on December 2016.
- ◆ IWLA, [Top Female Professional](#), as a recognition of [excellence in physics research and education](#), December 2015.

## Grants

- ◆ U.S. Department of Energy, “Study of Gluon Transverse Momentum Distributions with J/Ψ Production in the E1039 Polarized Drell-Yan Experiment”, DE-FG02-07ER41528, PI, 2018-2019 (\$125,000).
- ◆ Jefferson Lab., “1/2 Postdoctoral Research Associate Position for Dr. Krishna Adhikari”, January - May 2017 (\$13,119).
- ◆ U.S. Department of Energy, “Nuclear Dependence of Delta and Lambda Production”, DE-FG02-07ER41528, PI, 2016-2019 (\$317,000).
- ◆ ODU data-mining fund , travel award for my postdoc Dr. Krishna Adhikari to attend a workshop in July 2015 (\$1000).
- ◆ ODU data-mining fund, travel award to support my extended Jefferson Lab visit in Spring 2015 (\$2000).
- ◆ ODU data-mining fund , travel award for my postdoc Dr. Krishna Adhikari to attend a workshop in August 2014 (\$1100).
- ◆ Jefferson Science Associates, Thomas Jefferson National Accelerator Facility, G00000799, “Bridged-Appointment Faculty Position”, Co-PI, 2014-2019 (\$535,433).

## Graduate Students & Post-doctoral Mentoring

### ◆ Post-doctoral Research Associate:

- \* **Current:** Dr. Md Latiful Kabir, 2017 – Present.
- \* **Former:** Dr. Krishna Adhikari, 2014 – 2017.

### ◆ Graduate Students:

- \* **Current:** Shirsendu Nanda (PhD, expected 2022)
- \* **Former:** Pubuduni Ekanayaka Mudiyansele Egoa Walawwe (MS 2018).

## Invited Talks

- ◆ “QCD Signature in Nuclei: Hadronization and Color Transparency Studies in CLAS-6/12”, EIC Users Group Meeting, Washington, D.C., July 31<sup>st</sup>, 2018.
- ◆ “Study of Color Transparency in Exclusive Vector Meson Electroproduction off Nuclei”, CLAS Collaboration Meeting, Jefferson Lab, Newport News, Mar. 9<sup>th</sup>, 2018.
- ◆ “DC Calibration - status and plans”, (*by my current postdoc Dr. Md Latiful Kabir*) CLAS12 First Experiment Workshop, Jefferson Lab, Newport News, Mar. 6<sup>th</sup>, 2018.
- ◆ “Drift Chambers Calibration”, First CLAS12 Experiment Workshop, Newport News, VA, March 28<sup>th</sup>, 2017.
- ◆ “New results on spin structure functions at very low momentum transfers from Jefferson Lab”, (*by my former postdoc Dr. Krishna Adhikari*) Baryons 2016, Tallahassee, FL, May 16<sup>th</sup> - 20<sup>th</sup>, 2016.
- ◆ “Hadronization with JLab 6/12 GeV”, Next Generation Nuclear Physics with JLab12 and EIC, February 12<sup>th</sup>, 2016.
- ◆ “The Emergence of Hadrons from QCD Color”, Fall APS Division of Nuclear Physics Meeting, Oct 28<sup>th</sup>, 2015.
- ◆ “Data Conversion Progress”, International Workshop on Experimental and Theoretical Topics in CLAS Data Mining, July 27<sup>th</sup>, 2015.
- ◆ “Measuring Antiquarks in the Proton”, MSU Experimental Nuclear Physics Colloquium, May 5<sup>th</sup>, 2014.
- ◆ “Recent Progress of the E-906/SeaQuest Drell-Yan Experiment at Fermilab”, ODU Experimental Nuclear Physics Seminar, Jun 26<sup>th</sup>, 2013.
- ◆ “Drell-Yan measurements with the E906/SeaQuest Experiment at Fermilab”, Hall-A, JLab, Experimental Physics Seminar, Jun 6<sup>th</sup>, 2013.
- ◆ “Overview of color transparency measurements”, 11<sup>th</sup> Conference on the Intersections of Particle and Nuclear Physics (CIPANP 2012), at St. Petersburg (Florida), Jun 2012.
- ◆ “CT in Rho production”, Nuclear Chromo-Dynamic Studies with a Future Electron Ion Collider Workshop, at Argonne National Laboratory, Apr 2010.
- ◆ ”Search for the Onset of Color Transparency in Rho Electroproduction”, Experimental Nuclear Physics Seminar at Rutgers University, Oct 2008.
- ◆ “Search for the Onset of Color Transparency @ CLAS Detector”, Experimental Nuclear Physics Seminar at Old Dominion University, Nov 2007.
- ◆ “Search of Color Transparency using CLAS Detector”, RHIC Spin Physics Seminar at Brookhaven National Laboratory, Nov 2007.
- ◆ “Search for the Onset of Color Transparency @ CLAS Detector”, Medium Energy Physics Group Seminar at Ohio University, Nov 2007.

## Oral Communications

- ◆ “Highlights of Fragmentation Studies in CLAS”,  
DNP Meeting 2018, Waikoloa, Hawaii, Oct 25, 2018.
- ◆ “Study of Forward and Backward Fragmentation Processes in  $\Lambda^0$  Leptonproduction”,  
DNP Meeting 2018, Waikoloa, Hawaii, Oct 25, 2018.
- ◆ “CLAS12 Drift Chambers Tracking and Calibration”, (*by my postdoc Dr. Md Latiful Kabir*)  
APS April Meeting Poster, Columbus, Ohio, Apr. 16, 2018.
- ◆ “Color Transparency Experiment: Motivation and Setup”,  
16<sup>th</sup> Annual Graduate Student Research Symposium Poster, Mississippi State, MS, Feb. 17,  
2018 (*by my former MS GS Pubuduni Ekanayaka*).
- ◆ “Color Transparency Experiment: Motivation and Setup”, (*by my former MS GS Pubuduni*)  
UM–MSU 2018 Joint Physics Research Symposium Poster, Oxford, MS, Apr. 8, 2018.
- ◆ “Color Transparency Experiment: Motivation and Setup”, (*by my former MS GS Pubuduni*)  
Physics Graduate Student Journal Club Colloquium, Mississippi State, MS, Nov. 17, 2017.
- ◆ “Drift Chamber Tracking for CLAS12”, (*by my postdoc Dr. Md Latiful Kabir*)  
CLAS Collaboration Meeting, Jefferson Lab, Newport News, Oct. 5, 2017.
- ◆ “New results on spin structure functions at very low momentum transfers from Hall B in  
Jefferson Lab”, (*by my former postdoc Dr. Krishna Adhikari*)  
APS "April" Meeting, Washington, DC, January 28<sup>th</sup> - 31<sup>st</sup>, 2017.
- ◆ “Hadronization of  $\Lambda^0$  channel: analysis progress”, (*by my postdoc Dr. Krishna Adhikari*)  
International Workshop on Experimental and Theoretical Topics in CLAS Data Mining,  
July 27<sup>th</sup>, 2015.
- ◆ “Highlights of the E906/SeaQuest Experiment at Fermilab”,  
Gordon Conference on Photonuclear Reactions poster, Aug. 2012.
- ◆ “Search for the onset of color transparency in  $\rho^0$  electroproduction off nuclei”,  
Gordon Conference on Photonuclear Reactions poster, Aug. 2012.
- ◆ “Hadronization dynamics of  $\Lambda^0$  baryon”,  
APS Meeting contributed talk, Apr. 2011.
- ◆ “Measurement of the anti-quark distributions on Drell-Yan process”,  
APS Meeting contributed talk, Feb. 2010.
- ◆ ”Study of  $\Lambda^0$  hadronization at CLAS detector”,  
CLAS Collaboration Meeting contributed talk, Nov. 2009.
- ◆ ”Search for Color Transparency in  $\rho^0$  Electroproduction”,  
Medium Energy Physics Seminar at Argonne National Laboratory, Dec. 2007.
- ◆ “Chasing Color Transparency with Exclusive Vector Meson Electroproduction”,  
Student Lunch Seminar at Argonne National Laboratory, Jan. 2007.
- ◆ “Search for Color Transparency using CLAS Detector”,  
Medium Energy Physics Seminar at Argonne National Laboratory , Feb. 2007.

- ◆ “Search for the Onset of Color Transparency @ CLAS: JLab E02-110 Experiment”, CLAS Collaboration Meeting, June 2006.
- ◆ “Search for the Onset of Color Transparency @ CLAS: JLab E02-110 Experiment”, Hampton University Graduate School contributed talk, June 2005.

## **Proposals**

- ◆ Developed experiments for JLab 12-GeV program. I am a co-spokesperson of the approved proposals; E12-06-106 & E12-06-117, entitled respectively ”Study of Color Transparency in Exclusive Vector Meson Electroproduction off Nuclei” and “Quark Propagation and Hadron Formation”.

## **Publication Summary**

- ◆ Co-author of 149 papers; 2 in Nature, 1 in Nature Communications, 1 in Science, and 36 in Phys. Rev. Letters. See my [full publications list](#).