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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 hadronization; that is, the dynamics of a quarks propagation and hadrons formation in a cold nuclear matter, and a color transparency; that is, the formation and evolution of a small size configuration to a regular hadron,
- ◆ Nucleon structure via the study of the anti-quark asymmetry on Drell-Yan process.

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.
Ph.D Advisor: Dr. Kawtar Hafidi

Education

- ◆ June 2008 Ph.D 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 calculus-based physics course, Physics III; PH2233, in Fall 2016.
- ◆ Taught Intermediate Mechanics; PH4223/6223, in Spring 2016.
- ◆ Taught Intermediate Mechanics; PH4213/6213, in Fall 2015.
- ◆ Taught Nuclear Physics; PH8613-1, in Fall 2014.

Ongoing Research Projects:

- ◆ I am currently involved in the following projects:
 - ✓ Studying the hadronization of Λ^0 hyperon in the current and spectator fragmentation regions using the EG2 (E02-110 & E02-104) data-sets taken in Hall-B, JLab.
 - ✓ Developing the calibration, debugging and monitoring tools for the CLAS12 drift chambers housed in Hall-B, JLab, in addition to the tracking software for the upcoming BoNuS12 ("Barely off-shell Nucleon Structure") experiment.
 - ✓ Nuclear Data Mining which aims to combine and re-analyze the previously processed and reviewed 6 GeV data-sets with an up-to-date reconstruction software developed to be used in a common and user friendly format. My current commitment is to test and check the implemented data with all their cuts and corrections, and get more familiar with the utilized "JYTHON" software to use it in the integration of any other nuclear data-sets.
 - ✓ Refining the analysis of the E03-006 data-set. A measurement that 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. My ongoing cross-check work aims to finalize and strengthen the extracted results to be submitted for a CLAS review.
 - ✓ E906/SeaQuest experiment which seeks to determine the sea-antiquark asymmetry, \bar{d}/\bar{u} , by measuring 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 to the study of other topics like the quark energy loss in cold nuclear matter. Since the experiment started its production runs I am currently contributing by taking shifts and supporting the ongoing data calibration and analysis efforts.

Completed Research Work:

- ✓ My previous commitment toward the E-906/SeaQuest experiment was:
 - * Co-led the effort of building a new drift chamber for the E-906 second run. I mainly participated on the process of stretching and measuring the wires' tension, in addition to the formation of the gas seal windows.

* Led the work of refurbishing, calibrating, maintaining and monitoring the high voltage system and electronics readouts of the old sets of drift chambers mounted on the E-906 spectrometer.

✓ Calibrated and processed the data of JLab E07-009 & E08-024 experiments, and took the responsibility of maintaining the experiment's software and databases.

✓ Calibrated the ^3He polarized target's cells utilized in several Hall-A, JLab, experiments using a low intensity laser beam to determine the cell's wall thickness and the target density.

✓ Participated in the commissioning and shielding of the Gas Cherenkov PMTs mounted on the Hall A Big-bite spectrometer, JLab.

✓ Finished the CLAS review of my Ph.D data sets; JLab E02-110 experiment.

My commitment toward my thesis project was:

* Calibrating the time-of-flight system and processing the full data sets.

* Analyzing the whole data sets and performing a complete study of all correction related either to the physics of interest or the acceptance of CLAS detectors. This work searched for the onset of color transparency via the exclusive ρ^0 electroproduction off nuclei.

* Establishing a full cross-check of the results in two-years of the analysis review executed by elected CLAS committee members.

Work Services:

✓ Chair of the colloquium committee at the MSU physics department since August 2015, and a member of it since August 2014.

✓ Secretary of the CLAS speakers committee representing the CLAS collaboration at JLab since January 2015, and a representative of the nuclear physics working group on it since March 2014.

✓ Member of the ongoing review committee of the CLAS data mining analyses using the EG2 data-sets.

✓ Member of the nuclear physics working group in the JLab Electron-Ion Collider project since 2009.

✓ Was a member of the review committee of a 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 ^3He polarized target's analysis, and, Arun Tadepalli, throughout E906 summer and thesis projects.

Professional Organizations and Activities

- ◆ American Physical Society, 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 Collaboration, Fermilab.
- ◆ Association of Women in Science.
- ◆ International Women's Leadership Association, IWLA.

Awards

- ◆ Argonne National Lab, "Graduate Fellowship" (2003-2008).
- ◆ Jefferson Science Associates/Jefferson Lab., "Bridged-Appointment Faculty Position" (2014-2019).
- ◆ IWLA, "[Top Female Professional](#)", as a recognition of [excellence in physics research and education](#), December 2015.

Invited Talks

- ◆ "Hadronization with JLab 6/12 GeV",
Next Generation Nuclear Physics with JLab12 and EIC, February 12th, 2016.
- ◆ "The Emergence of Hadrons from QCD Color",
Fall APS Division of Nuclear Physics Meeting, Oct 28th, 2015.
- ◆ "Data Conversion Progress",
International Workshop on Experimental and Theoretical Topics in CLAS Data Mining,
July 27th, 2015.
- ◆ "Measuring Antiquarks in the Proton",
MSU Experimental Nuclear Physics Colloquium, May 5th, 2014.
- ◆ "Recent Progress of the E-906/SeaQuest Drell-Yan Experiment at Fermilab",
ODU Experimental Nuclear Physics Seminar, Jun 26th, 2013.
- ◆ "Drell-Yan measurements with the E906/SeaQuest Experiment at Fermilab",
Hall A, JLab, Experimental Physics Seminar, Jun 6th, 2013.
- ◆ "Overview of color transparency measurements",
11th 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 the E906/SeaQuest Experiment at Fermilab”, Gordon Conference on Photonuclear Reactions poster, Aug 2012.
- ◆ “Search for the onset of color transparency in ρ^0 electroproduction off nuclei”, Gordon Conference on Photonuclear Reactions poster, Aug 2012.
- ◆ “Hadronization dynamics of Λ^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 Λ^0 hadronization at CLAS detector”, CLAS Collaboration Meeting contributed talk, Nov 2009.
- ◆ ”Search for Color Transparency in ρ^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, Jun 2006.
- ◆ “Search for the Onset of Color Transparency @ CLAS: JLab E02-110 Experiment”, Hampton University Graduate School contributed talk, Jun 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”.

Computer Skills

- ◆ Expert in Fortran, PAW, BASH and C shell.
- ◆ Proficient in C, C++, ROOT, MYSQL database, JAVA, GROOVY and Lab-View.

Publication Summary

- ◆ Co-author of 103 papers: 2 in Nature and Science and 39 in Phys. Rev. Lett. See the enclosed publications list.

References

- ◆ **Dr. Donald F. Geesaman**
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