SHALAUDDIN

Ph.D. Candidate in Atomic, Molecular & Optical (AMO) Physics

Graduate Research Assistant · James R. Macdonald Laboratory · Department of Physics · Kansas State University

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RESEARCH PROFILE

Experimental atomic, molecular, and optical (AMO) physicist specializing in ultrafast femtosecond laser science. My research investigates changes in molecular structure and dynamics induced by ultrafast laser–molecule interactions, using two-color femtosecond pump–probe spectroscopy, time-resolved Coulomb explosion imaging, and coincidence ion momentum imaging (COLTRIMS / reaction microscope) at the James R. Macdonald Laboratory, a U.S. Department of Energy–funded center for AMO science.

RESEARCH INTERESTS

- Ultrafast molecular dynamics: photoinduced isomerization, dissociation, and coherent vibrational motion
- Time-resolved Coulomb explosion imaging of molecular fragmentation
- Strong-field ionization and ultrafast X-ray science
- Coincidence momentum imaging (COLTRIMS / reaction microscope) and pump–probe spectroscopy

EDUCATION

Ph.D. in Physics **2021 – Present**

Kansas State University, Manhattan, KS, USA

Advisor: **Prof. Artem Rudenko** · Research area: Experimental Atomic, Molecular & Optical Physics

M.S. in Physics **2011 – 2012**

Jahangirnagar University, Dhaka, Bangladesh

B.Sc. (Honors) in Physics **2007 – 2011**

Jahangirnagar University, Dhaka, Bangladesh

RESEARCH EXPERIENCE

Graduate Research Assistant, James R. Macdonald Laboratory **2021 – Present**

Department of Physics, Kansas State University · Advisor: Prof. Artem Rudenko

Ultrafast Dynamics of Iodomethane (CH_3I) — *Lead Ph.D. project*

- Investigate excitation, ionization, and dissociation of CH_3I using two-color femtosecond pump–probe spectroscopy.
- Use coincident fragment measurements to disentangle intensity-dependent dynamics, including vibrational excitation, predissociation, and dissociative-ionization pathways.

Ultraviolet Photodynamics of 1,2-Dichloroethylene — *Collaborative project*

- Examine photoinduced dynamics of the cis and trans isomers of 1,2-dichloroethylene using time-resolved Coulomb explosion imaging.
- Analyze fragment momenta, ion yields, and kinetic-energy distributions to characterize isomerization and competing dissociation pathways.

Coherent Vibrational Dynamics in Trifluoroiodomethane (CF_3I) — *Collaborative project*

- Probe laser-induced coherent vibrational motion via time-resolved Coulomb explosion imaging.
- Extract structural information on nuclear dynamics from time-dependent fragment-momentum correlations.

TECHNICAL EXPERTISE

- **Experimental methods:** Femtosecond laser systems, two-color pump–probe spectroscopy, Coulomb explosion imaging, strong-field ionization, experimental optics and beam alignment
- **Instrumentation:** COLTRIMS / reaction microscope, coincidence ion momentum spectroscopy, particle detectors, vacuum systems, data-acquisition electronics
- **Data analysis & computation:** Scientific programming, three-dimensional momentum reconstruction, coincidence data analysis, computational modeling and simulation of molecular fragmentation

TEACHING EXPERIENCE

Graduate Teaching Assistant **Aug 2021 – Dec 2022**

Department of Physics, Kansas State University, USA

Lecturer in Physics **Sep 2014 – Jul 2021**

Department of Physics, Daffodil International University, Dhaka, Bangladesh

- Taught undergraduate physics courses and mentored students for nearly seven years prior to doctoral study.

SCHOOLS & WORKSHOPS

SLAC Ultrafast X-ray Summer School (UXSS) **Jun 2024**

SLAC National Accelerator Laboratory, California, USA

- Participation funded by a U.S. Department of Energy (DOE) grant to the James R. Macdonald Laboratory.

AWARDS & HONORS

- **Jahangirnagar University Complementary Scholarship** — awarded in all four years of undergraduate study for academic excellence.

PROFESSIONAL MEMBERSHIPS

- Member, American Physical Society (APS), USA
- Member, Jahangirnagar University Physics Club, Bangladesh

LANGUAGES

Fluent in English, Bangla, and Hindi.

REFERENCES

Prof. Artem Rudenko

Doctoral Advisor · James R. Macdonald Laboratory, Department of Physics, Kansas State University, USA

Prof. Daniel Rolles

James R. Macdonald Laboratory, Department of Physics, Kansas State University, USA