Roy Ready

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Education

08/2014 – 05/2021 Ph.D. of Physics — Michigan State University, East Lansing
08/2014 – 08/2016 M.S. of Physics

GPA 3.7352. Nuclear Science and Security Consortium fellow.

Elective courses:

Data Analysis Methods—Frequentist/Bayesian methods, Monte Carlo simulations with C++ & ROOT.

Machine shop—operation of heavy equipment, e.g. lathes and drill presses.

Nuclear Structure—shell model calculations with Python.

Beam Physics—Optimization of accelerator geometry using COSY Infinity.

08/2012 – 05/2014 B.S. of Physics, Summa Cum Laude — California State University, Long Beach (CSULB), Long Beach, CA
GPA 3.958

08/2008 – 05/2012 A.A. of Math & Science, with High Honors — Cypress College, Cypress, CA
GPA 3.93

Summer Schools:

The George Washington University Boot Camp on Nuclear Security Policy (D.C. 2019)— Nuclear security and policy lectures, site visits, final oral presentation.

U.S. Particle Accelerator School (Rutgers 2015)—Introduction to accelerator physics theory.

Research Experience

03/2022 – present Postdoctoral scholar — University of California, Santa Barbara

Development of strontium ion trap for quantum sensor applications. Development of hadronic electric dipole moment experiment using radioactive molecules. PI: Dr. Andrew Jayich.

07/2021 – 02/2022 Research Physicist — Naval Research Laboratory, Washington, D.C.

Development of an entangled rubidium atomic clock for improved instability to test fundamental theory and space applications. Characterization of rubidium magneto-optical trap with tapered amplifier diode laser. Development of high-finesse optical cavity. Published memorandum report (public release) in Jan-2022. PI: Dr. Scott Crane.

09/2015 – 07/2021 Research Assistant — Michigan State University, East Lansing

Design, assembly, operation of precision 30 kV bipolar power supply testing station. Surface processing and conditioning of high voltage electrodes to more than double the applied electric field used in Bishof et al., PRC 94, 025501 (2016). Fluxgate magnetometry of high-purity metals in magnetically-shielded environment. Characterization of directed atomic beam angular distribution using laser induced fluoroscopy with a frequency-doubled, tuneable Ti:Sapphire laser. Advisor: Dr. Jaideep Singh.

01/2019 – 04/2019 Research Assistant — Lawrence Livermore National Lab, Livermore

Nuclear decay precision spectroscopy of fission decay chain products. Calibration measurements with ten known radiation sources at 95 mm and 160 mm sample-detector distances. Calibrated the detector efficiency Geant4 Monte Carlo computer model to match measured data within 3% using methods similar to Helmer et al. NIM 511, 360–381 (2003). Design position-repeatable, distance-variable gamma sample mount. Mentors: Dr. Nicholas Scielzo and Dr. Kay Kolos.

02/2018 – 08/2018 Research Assistant Argonne National Laboratory, Lemont

High voltage system upgrade and ultrahigh vacuum reassembly for tabletop atomic spin precession frequency measurement. Laser induced fluoroscopy of stable radium for laser cooling Zeeman slower development. Mentor: Dr. Matt Dietrich. Supported by the Science Graduate Student Research (SCGSR) award, MSU, and DOE.

01/2015 – 08/2015 Research Assistant Michigan State University, East Lansing

Numerical optimization of accelerator electromagnetic (EM) focusing components. Muon $g-2$ storage ring magnetic plate parallelism measurements at Fermilab, Chicago. Advisor: Dr. Michael Syphers.

08/2014 – 12/2014 Teacher Assistant Michigan State University, East Lansing

Instructor for undergraduate electromagnetism lab course.

01/2014 – 06/2014 Research Apprentice Jet Propulsion Laboratory (JPL), Pasadena
08/2013 – 01/2014 Research Intern (unpaid)

Promotion from unpaid to paid position. Wrote a suite of Interactive Data Language (IDL) programs to analyze 17 years of satellite images to derive time-dependent temperature behavior of Jupiter's atmosphere. Participated in collection of Jupiter images using the Infrared Telescope Facility. Mentor: Dr. Glenn Orton.

05/2013 – 07/2013 Research Assistant California State University, Long Beach,
05/2012 – 07/2012 Long Beach

Reproduced Levin et al. MNRAS 324:4, 917–922 (2001) neutron star dynamics results and adapted for quark star gravitational wave emission. Reproduced Ouyed et al. ApJ 702:2, 1575–1583 (2009) quark novae dynamics results and surveyed galaxy reionization programs for further studies.

08/2011 – 08/2012 SI Leader Cypress College, Cypress

Supplemental Instruction (SI). Lead group study sessions and tutor physics mechanics course. Mentor: Dr. Ron Armale.

Honors and Awards

12/2020 College of Natural Science Completion Fellowship

06/2019 Finalist Oral Presentation for Nuclear Science and Security Consortium

09/2017 Science Graduate Student Research Program (SCGSR). DOE-funded, 6 months. 52 awards issued nationwide in 2017 Solicitation 1.

01/2014 Robert D. Rhodes Award. Department recognition of one outstanding junior/senior.

08/2013 John & Terry Milligan Physics Scholarship. Awarded for two semesters. Eligible to undergraduate physics students working part-time to pay for education. One awarded per year.

01/2013 Frank Doyle & M. Gertrude R. Doyle Scholarship. One year. Eligible to alumni from California community colleges. Awards based on applicants' timeline for achieving their academic goals.

01/2013 CSU Future Scholar, Long Beach. Eligible to disadvantaged students educated in California. Recipient articulates professional objectives in the context of their educational background.

01/2011 Jet Propulsion Laboratory Undergraduate Scholar (JPLUS). Awarded to outstanding STEM students from Southern California community colleges.

Publications

"Progress Update of Laser-Cooled Rubidium Clock," R. A. Ready, A. Black, R. Bradley, S. Crane (Approved for public release/unlimited distribution, memorandum report)

"Optical Studies of High Energy Krypton & Rubidium Ion Beams Implanted in Solid Krypton," B. Loseth, G. Arrowsmith-Kron, R. A. Ready, J. T. Singh, et al. (in preparation)

"Laser Induced Fluorescence of Neutral Rubidium and Rubidium Ions Embedded in Solid Krypton," E. White, B. Loseth, R. A. Ready, J. T. Singh et al. (in preparation)

"Surface Processing and Discharge-Conditioning of High Voltage Electrodes for the Ra EDM Experiment," R. A. Ready, G. Arrowsmith-Kron, K. G. Bailey, D. Battiglia, M. Bishof, D. Coulter, M. R. Dietrich, R. Fang, B. Hanley, J. Huneau, S. Kennedy, P. Lalain, B. Loseth, K. McGee, P. Mueller, T. P. O'Connor, J. O'Kronley, A. Powers, T. Rabga, A. Sanchez, E. Schalk, D. Waldo, J. Wescott, J. T. Singh. https://doi.org/10.1016/j.nima.2021.165738 (2021)

Ready, R. A. (2021). "High voltage development and laser spectroscopy for the search of the permanent atomic electric dipole moment of Radium-225," R. A. Ready, Thesis, 28546991 (2021) Proquest link

"Spectroscopic Studies and the Lifetime Measurement of the $6d7p\ ^3F_2^o$ state of radium," D. Booth, T. Rabga, R. A. Ready, K. G. Bailey, M. Bishof, M. R. Dietrich, J. P. Greene, P. Mueller, T. P. O'Connor, J. T. Singh. Spectrochim. Acta B 172 105967 (2020)

"Conceptual Design Of A Ring For Pulse Structure Manipulation Of Heavy Ion Beams At The MSU NSCL," A. Pham, S. Lund, R. A. Ready, M. Syphers, C. Y. Jonathan NAPAC-2016-TUA1CO05

Presentations

01/2022 "Early progress on a rubidium atomic clock with spin squeezing", Sigma Xi postdoctoral symposium, Naval Research Laboratory

10/2021 "Upgrades for an improved measurement of the Electric Dipole Moment of Radium", ANL

01/2021 "Upgrades for an improved measurement of the Electric Dipole Moment of Radium-225", MSU

10/2020 "Upgrades for an improved measurement of the Electric Dipole Moment of Radium-225", MSU

06/2020 "Upgrades for an improved measurement of the Electric Dipole Moment of Radium-225", DAMOP. DAMOP 2020 video (start at 54:40)

06/2020 "Towards a More Sensitive Measurement of the Atomic Electric Dipole Moment of ^{225}Ra", NSSC Virtual Scholar Showcase. Video: Youtube

03/2020 "Towards a More Sensitive Measurement of the Atomic Electric Dipole Moment of Radium-225," APS March Meeting. Video: meetings.aps.org/Meeting/MAR20/Session/P01.2

01/2020 "Upgrades for an improved measurement of the Electric Dipole Moment of ^{225}Ra," MSU

10/19 "Towards Precision Gamma-Ray Intensity Measurements of Long-Lived Fission Products," Nuclear Science and Security Consortium Fall Workshop & Advisory Board Meeting, Livermore

04/2019 "Towards a more sensitive measurement of the permanent electric dipole moment of ^{225}Ra," APS April Meeting, Denver

02/2019 "Upgrades for an improved measurement of the Electric Dipole Moment of ^{225}Ra," MSU

01/2019 "Towards a more sensitive measurement of the permanent electric dipole moment of ^{225}Ra," MSU

11/2018 "High Voltage Upgrades for the ^{225}Ra Electric Dipole Moment Search," poster, Midwestern Cold Atom Workshop, University of Illinois at Urbana-Champaign

11/2016 "Upgrades for an improved measurement of the Electric Dipole Moment of ^{225}Ra," MSU, Nov 2016

10/2016 "Upgrades for an improved measurement of the EDM of ^{225}Ra," Division of Nuclear Physics, Vancouver

10/2016 "High Voltage Upgrades for the ^{225}Ra Electric Dipole Moment Search," poster, Midwestern Cold Atom Workshop, University of Chicago

05/2016 "An Update of the Spinlab Radium-225 EDM Electrode Development," MSU

04/2016 "Status of Magnetization Measurements of the Ra-225 EDM Electrodes: Phase 5," MSU Annual Munich-Michigan EDM Meeting

11/2015 "Progress Towards 300 kV/cm Electric Field for ^{225}Ra Electric Dipole Moment Search," poster, Midwestern Cold Atom Workshop, University of Wisconsin-Madison

05/2015 "Lasers are Cool," class presentation, MSU

12/2014 "Long-Term Time Variability of Temperature, Gas Abundance and Cloud Fields in Jupiter From Thermal Emission Observations," G. S. Orton, L. N. Flether, P. A. Yanamandra-Fisher, B. Fisher, T. K. Greathouse, S. Kim, **R. Ready**, J. Liu, T. Schneider, poster, AGU Fall Meeting

05/2014 "Measuring Raw Magnetite," class presentation, CSULB

05/2014 "Compiling a 3D Map of Jupiter's Atmosphere," CSULB

04/2014 "Report: 'Evidence for the existence of the astrophysically important 6.40-MeV state of ^{31}S", class presentation, CSULB

02/2014 "Applications of Photolithography," class presentation, CSULB

01/2014 "Seasonal and non-seasonal temperature variations in Jupiter's upper troposphere," Jet Propulsion Laboratory

12/2013 "Seasonal Variations in Jupiter's Tropospheric Temperatures," CSULB

05/2013 "MOSFET Clean Boost Guitar Pedal," class presentation, CSULB

Skills

Proficiency in laser spectroscpy and optics system design

Proficiency with lasers, including TO-can DL, TA DL, frequency-doubled and frequency-mixed Ti:Sapphire lasers

Proficiency in high voltage gradient surface processing

Proficiency in C++, ROOT, Geant4, Python

Proficiency in MATLAB, LabView, Wolfram Mathematica, COMSOL

Working knowledge of C, IDL, COSY Infinity, FORTRAN

Proficiency in clean room design and work procedure

Experience in high voltage system design and interface circuitry

Experience in high and ultrahigh vacuum systems: roughing pumps, TMPs, non-evaporable getters, TSPs, and ion pumps

Experience with fluxgate magnetometry

Experience in design of signal conditioning, filtering, safety interlock, instrument protection circuitry

Experience with lathes, mills, bandsaws, drill presses, pipe welding, etc.

Experience with carpentry, plumbing, home improvement, etc.

Proficiency in team and project management

Strong safety background from working at FRIB, NSCL, ANL, LLNL, JPL, Fermilab

Strong background in reproducible documentation of work

Outreach

Women and Minorities in the Physical Sciences (WaMPS) Graduate Mentor

FRIB Open House tour stop speaker

MSU Physics Graduate Organization Seminar Leader

Sigma Pi Sigma Member, Society of Physics (SPS) Officer (Long Beach Chapter, 2013-2014)

Mexican American Engineering Society (MAES) Science Extravaganza Workshop Class leader