AMY CHRISTINA GALL

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EXPERIENCE

2025 *to present*	**Assistant Professor |** Physics Department Auburn University, Auburn, Al
2025 *to present*	**Research Associate |** Smithsonian Astrophysical Observatory Center *for* Astrophysics | Harvard & Smithsonian (CfA), Cambridge, MA
2021 *to* 2025	**Astrophysicist |** Smithsonian Astrophysical Observatory Center *for* Astrophysics | Harvard & Smithsonian (CfA), Cambridge, MA
2019 *to* 2021	**Postdoctoral Researcher |** Smithsonian Astrophysical Observatory (SAO)
2016 *to* 2018	**Predoctoral Fellow |** Smithsonian Astrophysical Observatory
2014 *to* 2019	**Visiting Researcher |** Atomic Spectroscopy Group National Institute of Standards and Technology (NIST), Gaithersburg, MD
2014 *to* 2019	**Graduate Research Assistant |** Department of Physics and Astronomy Clemson University, Clemson, SC
2011 *to* 2013	**Manufacturing Engineer |** Mitsubishi Power Systems Americas Savannah Machinery Works, Savannah, GA

EDUCATION

August 2019	**Ph.D. Physics,** Clemson University, Clemson, South Carolina Dissertation topic*: "Inner Shell Atomic Processes in Highly Charged Argon EBIT Plasma Relevant to Astrophysics"*
May 2017	**M. S. Physics,** Clemson University, Clemson, South Carolina Thesis title: *"Investigation of the Contribution of Lower Charger State Ar Ions to the Unknown Faint X-Ray Feature Found in the Stacked Spectrum of Galaxy Clusters"*
May 2011	**B. S. Applied Physics,** Armstrong State University, Savannah, Georgia
December 2009	**B. S. Mechanical Engineering**, Georgia Institute of Technology, Savannah, Georgia

RESEARCH

Primary Interest	Laboratory Astrophysics; Atomic Spectroscopy; Spectral diagnostics; High-Energy Astrophysics; Ion Traps; Instrumentation and Detectors
Techniques	Production and confinement of highly charged ions using an electron beam ion trap (EBIT). Spectroscopic observations of the trapped plasma are made using a variety of detectors, including a flat field grazing-incidence EUV

spectrometer, high-purity germanium detector, silicon lithium detector, Johann-type crystal spectrometer, X-ray microcalorimeter, visible and X-ray CCD detectors, and a photomultiplier tube.

TECHNICAL EXPERIENCE

EBIT Activities

-Successfully restored the SAO electron beam ion trap (EBIT), leading the testing and repair of ultra-high vacuum, cryogenic, and electronic systems.

-Designed and built a differentially pumped, ballistic gas injection system for injection of neutral atoms.

-Redesigned the EBIT trapping electronics system to increase user control.

-Updated the EBIT control system to expand experimental capabilities and provide additional safety and monitoring systems.

-Tested and installed a Metal Vapor Vacuum Arc System to allow injection of metal ions into the EBIT.

-Restored a high-resolution X-ray microcalorimeter detector.

-Designed an optical setup for imaging the EBIT ion cloud using a visible CCD detector. Designed an X-ray pinhole measurement for imaging the electron beam.

-Responsible for all EBIT laboratory operations, including planning and setting up experiments, operation and maintenance of the EBIT and detectors, maintaining up-to-date laboratory documentation, and data analysis.

-Responsible for expanding the facility (adding new detectors and capabilities) and creating documentation in preparation for the creation of a user facility.

Industry Work

Mitsubishi Power Systems | Engineer

-Worked extensively with various manufacturing-welding processes in the production/engineering environment. Activities included process development, creating various manufacturing and engineering related specifications, process methodology documentation, mentoring student interns, and daily manufacturing in-process assistance.

-Performed detailed metallographic examination, in a metallurgical lab environment, of a multitude of weld test specimens associated with manufacturing/process readiness.

Technical skills

Analysis tools: Igor-pro, Python, Matlab, CIAO, PyXspec, and PyAtomDB.

Laboratory: Cryogenic and ultra-high vacuum systems. Experience operating a flat field grazing-incidence EUV spectrometer, high-purity germanium detector, silicon lithium detector, Johann-type crystal spectrometer, X-ray microcalorimeter, visible and X-ray CCD detectors, and photomultiplier

tubes. Experience with Electron Beam Ion Traps at SAO, Clemson University, and NIST.

TEACHING & MENTORING EXPERIENCE

2024 *to* 2025 **Post-Baccalaureate Student Advisor |** SAO

I worked with a student for 1 year between his undergraduate and graduate studies. The student carried out a number of experimental and data analysis projects. The student has designed a system to measure EBIT vibrations, designed support structures for instrumentation, taken systematic X-ray and EUV measurements with the EBIT, developed a cosmic ray removal procedure, and is co-authoring multiple papers. He also expanded the EBIT's control system to include control of a Metal Vapor Vacuum Arc System.

2024, 2025 **Solar REU Advisor |** SAO

2024: I worked with an REU student for 12 weeks to design a compound injection system for the EBIT. The student created a CAD model of the system, performed calculations in Python, created safety procedures for handling materials, and made a detailed parts list. She is presenting results at the winter AAS meeting in 2025.

2025: Worked with an REU student for 12 weeks to develop a high-resolution crystal spectrometer calibration method.

2022, 2025 **Predoctoral Advisor |** SAO

2025: Working with a graduate student from Clemson University during his 6-month predoctoral fellowship at the CfA. The student helped set up a new EUV spectrometer and is taking spectroscopic measurements of highly charged Ne and Fe ions.

2022: I was the official SAO advisor of a graduate student during her 8-month predoctoral fellowship at the CfA. Projects included X-ray measurements of highly charged Si, Ba, and Ar ions, rebuilding an X-ray microcalorimeter, and exploratory IR measurements of Si.

2013 *to* 2017 **Graduate Teaching Assistant |** Clemson University

I taught a wide variety of laboratory courses including: algebra based physics, calculus-based physics, solar system astronomy, and stellar astronomy.

Prepared short lectures and led outdoor observing activities for astronomy laboratory courses.

Summer 2014 **Atomic Physics Laboratory Manager** | Clemson University

Managed and mentored a group of undergraduate researchers from physics, computer science and engineering backgrounds.

Research projects included the design of a gas injection manifold, EBIT irradiation port, and a multi-detector x-ray calibration box.

AWARDS& FUNDING

Awards

2018, Clemson University department of Physics and Astronomy, Outstanding Graduate Teaching Assistant

2018, Clemson University Symposium for the Introduction to Research in Physics and Astronomy Poster Prize

2005 *to* 2010, Georgia Helping Outstanding Pupils Educationally (HOPE) Scholarship

Funding (as PI) & Fellowships

2024, **NASA Astrophysics Decadal Survey Precursor Science program:** *Powerful X-ray Diagnostics for the next Great Observatory.* **PI: A. Gall,** allocated $727k

2024, **NASA Astrophysics Research and Analysis Program:** *Accurate Diagnostics for X-ray Observations: High-resolution Measurements of Inner-shell Transitions.* **PI: A. Gall,** allocated $655k

2024, **NASA Heliophysics Instrument Development for Science program:** *Laboratory XUV Spectroscopy: Increasing the Scientific Return of Solar Missions.* **PI: A. Gall,** allocated $850k

2023, **Chandra X-ray Observatory Cycle 25 theory proposal:** *Updating Fe L-shell wavelengths for stellar coronal studies.* **PI: A. Gall,** allocated $95k

2023, **Smithsonian Institution (SI) Research Equipment Pool:** *Acquisition of a crystal spectrometer for EBIT studies,* **PI: A. Gall,** allocated $32k

2022, **Chandra X-ray Observatory Cycle 24 theory proposal:** *Implementing experimental ionization and recombination rates for supernovae abundance analysis.* **PI: A. Gall,** allocated $90k

2022, **Smithsonian Institution Scholarly Studies Grant:** *Preparing Models for New X-ray Observatories Using the SAO EBIT.* **PI: A. Gall,** allocated $47k

2021, **CfA IR&D** funding: *Installing a Metal Vapor Vacuum Arc Ion Source for EBIT Injections.* **PI: A. Gall,** allocated $41k

2020, **CfA IR&D** funding: *Updating the SAO EBIT Control Systems.* **PI: A. Gall**, allocated $61k

2016 *to* 2018, **SAO Predoctoral Fellowship**

Fellowship advisors: Eric Silver (2016), Randall Smith (2017 *to* 2018)

2015 *to* 2018**, Clemson University Professional Enrichment Grant**

Awarded nine travel grants during this period.

Funding (as Co-I)

2022, **NASA Astrophysics Research and Analysis Program,** PI: G. Brown:

High Accuracy Comprehensive Measurements of High Energy Dielectronic Recombination Decay Channels and Resonance Strengths for Interpreting High Resolution X-ray Spectra from Hot Celestial Sources

2017, **NASA Astrophysics Research and Analysis Program** PI: N. Brickhouse: *An Experimental Program to Achieve High Accuracy Atomic Rates for the X-ray Astrophysics Recovery Mission and Beyond*

Service & MEMBERSHIPS

Mission Development

Line Emission Mapper (LEM): co-chair of the calibration working group (2022 *to* 2024)

X-Ray Imaging and Spectroscopy Mission (XRISM): performance verification target team member.

Outreach

Science Club for Girls, CfA, 2023

Ask an astronomer, Hilliard elementary school (5th graders), 2021

Eclipse over Clemson, Clemson University, 2017

Department of Physics and Astronomy Outreach Program hosting Clemson Elementary School, Clemson University, 2015 *to* 2017

Math Kangaroo, Clemson University, 2015

Memberships

American Astronomical Society (AAS) | Member
American Physical Society (APS) | Member
CfA Women in Science | Member

Referee for

The Astrophysical Journal, Journal of Physics B, Journal of Instrumentation

Service

3rd Time Domain and Multimessenger workshop, member of the scientific organizing committee and co-lead of the atomic discussion group (2024)

AAS Laboratory Astrophysics Division committee, *Atoms Member-at-large* (2023- present)

NASA Astrophysics Research and Analysis Program (APRA) Review Committee (2023)

CfA High Energy Astrophysics Seminar, *organizer* (2021- 2024)

Physics and Astronomy Graduate Student Organization, Clemson University, organizer (2017 *to* 2018)

Clemson University Electron Beam Ion Trap Seminar, *organizer* (2015)

SELECTED PRESENTATIONS

Oral

"*The SAO EBIT: A Versatile Platform for Benchmark Atomic Measurements",* **AtomDB workshop,** Cambridge, MA, September 2025 (invited)

"*Enabling Astrophysical Discoveries: Cosmic Plasmas in the EBIT Lab",* **SAO PTRA Colloquium,** Cambridge, MA, March 2025 (invited)

"*Laboratory Astrophysics: Unlocking the Power of NASA's X-ray Observatories",* **Physics Colloquium,** Auburn, Al, Feb. 2025 (invited)

"*Measurement of the Effective Electron Density in the SAO EBIT",* **15th International Symposium on EBIS/T,** Kielce, Poland**,** Aug. 2024 (invited)

"*Electron Impact Ionization Cross Section Measurement of He-like Fe",* **244th AAS Meeting,** Madison, Wisconsin, June 2024

"*Establishing Spectroscopic Ground Truth with the SAO EBIT",* **CfA Strategic Plan Retreat,** Cambridge, MA**,** Feb. 2023

"*Update on the SAO EBIT facility",* **14th International Symposium of EBIS/T**, Whistler, BC Canada, June 2022 (invited)

"*Linear polarization measurement of satellite transitions produced in an EBIT Ar plasma",* **236th AAS Meeting**, June 2020

"*Measurements of Linear Polarization of Satellite Transitions from Li- and Be-like Ar Ions*", **NIST Atomic Spectroscopy Group Seminar**, April 2020 (invited)

"*EBIT Observation of Ar Dielectronic Recombination Lines near the Unknown Faint X-Ray Feature Found in the Stacked Spectrum of Galaxy Clusters*", **Southeast Laboratory Astrophysics Community Conference**, Clemson, SC, May 2019

"*Analysis of the Contribution of Ar Dielectronic Recombination Lines to the Unknown Faint X-Ray Feature Found in the Stacked Spectrum of Galaxy Clusters*", **20th International Conference on Atomic Processes in Plasmas**, Gaithersburg, MD, April 2019 (invited)

"*X-ray and EUV Spectroscopy of Highly Charged Ions*", **Clemson University Symposium for the Introduction to Research in Physics and Astronomy**, Clemson, SC, Aug. 2016

Poster

"Progress in XUV Fe Spectroscopy at the SAO EBIT in Support of Solar Missions", **246th AAS meeting***,* Anchorage, Alaska June 2025

"Measurement of the Effective Electron Density in the SAO EBIT", **21st meeting of the High Energy Astrophysics Division of the AAS***,* Horseshoe Bay Resort, Texas April 2024

"Incorporating Experimental Ionization and Recombination Rates into Astrophysical Models", **International School on Atomic and Molecular Data Evaluation and Curation***,* Valladolid, Spain, Oct. 2023

"Measurements from the SAO EBIT Facility in Support of X-ray Observatories", **242nd AAS Meeting***,* Albuquerque, NM, June 2023

"Calibration of the Line Emission Mapper (LEM) Observatory", **20th Meeting of the High Energy Astrophysics Division of the AAS**, Waikōloa, Hawai'i, May 2023

"Measurements of highly charged Si and Ba ions from the SAO EBIT", **20th International Conference on the Physics of Highly Charged Ions,** Matsue, Japan, September 2022

"*X-ray Measurements of Highly Charged Ar Plasma Produced in the SAO EBIT*", **235th AAS Meeting**, Honolulu, Hawaii, January 2020

"*X-ray Measurements of Highly Charged Ar Produced in an Electron Beam Ion Trap*", **11th International Conference on Atomic and Molecular Data and their Applications**, Cambridge, MA, November 2018

"*X-ray Spectroscopy of Highly Charged Ions*", **NASA Laboratory Astrophysics Workshop**, Athens, GA, April 2018

"*Contribution of Lower Charger State Ar Ions to the Unknown Faint X-Ray Feature Found in the Stacked Spectrum of Galaxy Clusters*", **Joint ICTP-IAEA School on Atomic Processes in Plasmas**, Trieste, Italy, March 2017

PUBLICATIONS

ORCID: https://orcid.org/0000-0002-8260-2229

- Y. Yang, Dipti, A. Foster, **A. Gall**, P. Szypryt, G. O'Neil, A. Hosier, A. Naing, D. Schultz, J.N. Tan, R.K. Smith, N. Brickhouse, Yu. Ralchenko, and E. Takacs. Experimental electron impact ionization cross sections of Fe XXV and Maxwellian-averaged rate coefficients, *A&A,* 700 A263 (2025). doi: https://doi.org/10.1051/0004-6361/202554332
- **A. Gall**, G.P. Mondeel, A. Foster, E. Takacs, N. Brickhouse, and R.K. Smith. Effective Electron Density Measurement via Ion Emission Imaging in the SAO EBIT, *JINST*, 29 C06036 (2025). doi: 10.1088/1748-0221/20/06/C06036
- **A. Gall**, A. Foster, Y. Yang, E. Takacs, N. Brickhouse, E. Silver, G.P. Mondeel, and R.K. Smith. The Status and Recent Updates of the SAO EBIT, *JINST,* 20 C03036 (2025). doi: 10.1088/1748-0221/20/03/C03036
- Y. Yang, Dipti, **A. Gall**, N. Brickhouse, H. Staiger, G. O'Neil, P. Szypryt, A. Foster, D. Schultz, A. Naing, J.N. Tan, D. Swetz, M. Fogle, R.K. Smith, Yu. Ralchenko, and E. Takacs. Charge-exchange processes in EBIT: implications for spectral analysis of few-electron Fe ions, *JINST,* 20 C04028 (2025). doi: 10.1088/1748-0221/20/04/C04028
- T. Burke, **A. Gall**, J. P. Marler, Dipti, G. O'Neil, P. Szypryt, Y. Yang, A. Naing, J.N. Tan, Yu. Ralchenko, S.M. Brewer, M.Fogle, and E. Takacs. High-n Rydberg States of Highly-charged Argon Ions Populated by Dielectronic Resonance Capture, *J. Phys. B*, in prep. (2024)
- Y. Yang, Dipti, C. Suzuki, **A. Gall**, R. Silwal, S. Sanders, A. Naing, J. Tan, E. Takacs, and Yu. Ralchenko, Observations and identifications of extreme ultraviolet spectra of Ca-like to Na-like neodymium ions using an electron beam ion trap", *J. Phys. B*, 56, 175003 (2023). doi: 10.1088/1361-6455/aceed9
- Y. Yang, Dipti, **A. Gall**, G. O'Neil, P. Szypryt, A. Hosier, A. Foster, A. Naing, J.N. Tan, D.R. Schultz, et al. Determination of Electron Beam Energy in Measuring the Electron-Impact Ionization Cross Section of He-like Fe24+, *Atoms*, 11, 44 (2023). doi:10.3390/atoms11030044

- R. Silwal, Dipti, E. Takacs, J.M. Dreiling, S.C. Sanders, **A.C. Gall**, B.H. Rudramadevi, J.D. Gillaspy, and Yu. Ralchenko. Spectroscopic analysis of M- and N-intrashell transitions in Co-like to Na-like Yb ions, *J. Phys. B*, 54, 245001 (2022). doi: 10.1088/1361-6455/ac44e1
- C. Suzuki, Dipti, Y. Yang, **A. Gall**, R. Silwal, S. Sanders, A. Naing, J. Tan, E. Takacs, and Yu. Ralchenko. Identifications of extreme ultraviolet spectra of Br-like to Ni-like neodymium ions using an electron beam ion trap, accepted to *J. Phys. B*, 54, 015001, (2021). doi: 10.1088/1361-6455/abc9cd
- G. O'Neil, S. Sanders, P. Szypryt, Dipti, **A. Gall**, Y. Yang, S. M. Brewer, R. Doriese, J. Fowler, A. Naing, D. Swetz, J. Tan, J. Ullom, A. V. Volotka, E. Takacs, and Y. Ralchenko. Measurement of the $^2P_{1/2}$-$^2P_{3/2}$ fine-structure splitting in fluorine-like Kr, W, Re, Os, and Ir, *Phys. Rev. A* 102, 032803 (2020). doi: 10.1103/PhysRevA.102.032803
- **A. C. Gall**, Dipti, S. W. Buechele, S. Sanders, R. Silwal, C. Szabo-Foster, N. Brickhouse, Yu. Ralchenko, and E. Takacs. Measurements of Linear Polarization of Satellite Transitions from Li- and Be- like Ar Ions, *J. Phys. B*, **53**, 145004 (2020). doi: 10.1088/1361-6455/ab8eff
- Dipti, S. W. Buechele, **A. C. Gall**, S. Sanders, C. Szabo-Foster, R. Silwal, E. Takacs, and Yu. Ralchenko. Linear Polarization of Anisotropically Excited X-ray Lines from the n=2 Complex in He-like Ar^{16+}, *J. Phys. B*, **53**, 115701 (2020). doi: 10.1088/1361-6455/ab7d25
- Dipti, A. Borovik, Jr., R. Silwal, J. M. Dreiling, **A. C. Gall,** E. Takacs, and Yu. Ralchenko. Dielectronic resonances of LMn and LNn ($n \geq 4$) series in highly-charged M-shell tungsten ions, *Phys. Rev. A,* **101**, 032503, (2020). doi: 10.1103/PhysRevA.101.032503
- **A. C. Gall**, A. R. Foster, R. Silwal J. M. Dreiling, A. Borovik, Jr., E. Kilgore, M. Ajello, J. D. Gillaspy, Yu. Ralchenko and E. Takacs. EBIT Observation of Ar Dielectronic Recombination Lines near the Unknown Faint X-Ray Feature Found in the Stacked Spectrum of Galaxy Clusters, *ApJ*, **872**, 194 (2019). doi: 10.3847/1538-4357/ab0177
- S.C. Sanders, R. Silwal, B.H. Rudramadevi, **A.C. Gall**, and E. Takacs. High-resolution X-ray spectroscopy of highly charged tungsten EBIT plasma, *Nucl. Instr. and Meth. B*, **431**, 47, (2018). doi: 10.1016/j.nimb.2018.06.013
- D. Medlin, W. Heffron, A. Siegel, K. Wilson, A. Klingenberger, **A. Gall**, M. Rusin, D. Dean, E. Takacs. Development of an X-ray Irradiation Port for Biomedical Applications at the CUEBIT facility*, J. Phys.: Conf. Ser.* 583, (2015). doi:10.1088/1742-6596/583/1/012048
- J. Klingenberger, M. Schott, T. Kimmel, D. Medlin, **A. Gall**, M. Rusin, D. Dean, B. Dean, E. Takacs. Modeling Low Energy X-ray Interactions with Biological Material at the CUEBIT, *J. Phys.: Conf. Ser.* 583, (2015). doi:10.1088/1742-6596/583/1/012046
- E. Takacs, T. D. Kimmel, K. H. Brandenburg, R. K. Wilson, **A. C. Gall**, J. E. Harriss, C. E. Sosolik. Diagnostic Measurements of CUEBIT Based on the Dielectronic Resonance Process, *AIP Conf. Proc.* 1640, 154 (2015). doi: 10.1063/1.4905414

Abbreviations used:

Phys. Rev. A | *Physical Review A*
J. Phys B | *Journal of Physics B: Atomic, Molecular and Optical Physics*
AIP Conf. Proc. | *American Institute of Physics Conference Proceedings*
ApJ | *The Astrophysical Journal*
A&A |*Astronomy & Astrophysics*

J. Phys.: Conf. Ser. | *Journal of Physics: Conference Series*
Nucl. Instr. and Meth. B | *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*
JINST | *Journal of Instrumentation*

AAS | American Astronomical Society
EBIT | Electron Beam Ion Trap
CfA | Center *for* Astrophysics | Harvard & Smithsonian