

Eric Matthias Edlund

Associate Professor
SUNY Cortland, Department of Physics
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EMPLOYMENT

Teaching Appointments

SUNY Cortland, Physics Department Associate Professor Assistant Professor	Cortland, NY 2021 - present 2017 - 2021
California Polytechnic University, Physics Department Visiting Lecturer	San Luis Obispo, CA Winter & Spring quarters, 2013
Princeton University, Physics Department Preceptor	Princeton, NJ Fall, 2012
Rider University, Department of Chemistry and Physics Lecturer	Lawrenceville, NJ Fall 2010

Research Appointments

Max Planck Institut für Plasmaphysik Turbulence and Transport Group Visiting Scientist	Greifswald, Germany August 2015 - December 2017
Massachusetts Institute of Technology Plasma Science and Fusion Center Staff Scientist Project Lead for the W7-X PCI Collaboration	Cambridge, MA August 2015 - December 2017
US Department of Energy Office of Fusion Energy Sciences Temporary Interdepartmental Work Detail Research Scientist	Germantown, MD April-May 2015
Princeton Plasma Physics Laboratory ITER and Domestic Tokamak Collaborations Research Physicist, RM-2	Princeton, NJ March 2015 - August 2015
Princeton Plasma Physics Laboratory Plasma Science and Technology Division Associate Research Physicist, RM-1	Princeton, NJ September 2009 - March 2015

EDUCATION

Massachusetts Institute of Technology
Ph.D., Physics

Cambridge, MA
2009

California State University Chico
B.S., Physics and Mathematics

Chico, CA
2003

COURSES TAUGHT

SUNY Cortland

PHY 105 - Elementary Mechanics and Heat (algebra-based)
PHY 201 - Principles of Physics I (calculus-based mechanics, lecture & lab)
PHY 202 - Principles of Physics II (calculus-based E&M, lecture & lab)
PHY 203 - Principles of Physics III (calculus-based, waves, optics, thermodynamics)
PHY 357 - Intermediate Laboratory
PHY 405 - Energy & Sustainability
PHY 420 - Classical Mechanics
PHY 429 - Special Topics: Advanced Classical Mechanics
Summer Python Programming School (unofficial, Summer 2020)

Cal Poly

PHYS 121 - College Physics I (algebra-based mechanics)
PHYS 132 - General Physics II (calculus-based, waves, optics and thermodynamics, lecture & lab)

Princeton University

PHY 103 - General Physics I (calculus-based mechanics, precept)

Rider University

PHY 200 - General Physics I (algebra-based mechanics, lab only)

GRANTS, PATENTS & INVENTIONS

“Phase contrast imaging for Wendelstein 7-X”

M. Porkolab (Principal Investigator), MIT and E. M. Edlund (co-Investigator), SUNY Cortland submitted to: US Department of Energy, Office of Science, Office of Fusion Energy Sciences (2021)
total award: \$900k, August 2021 - August 2024

“Construction of a Taylor-Couette device for the study of rotating turbulence”

E. M. Edlund

Submitted to: SUNY Cortland Faculty Research Program

total award: \$1250

“Diagnostic equipment for the Red Dragon Wind Tunnel facility”

E. M. Edlund and S. Nolan

Submitted to: SUNY Cortland Faculty Small Grant program

total award: \$500

“Optictool: the intuitive optical design platform for Research, Engineering, and Education”

E. M. Edlund and N. Rose

Application submitted to the SUNY Technology Accelerator Fund (July 2020)

“Intuitive optical design with web technologies”

E. M. Edlund and N. Rose

SUNY Invention Disclosure (April 23, 2020)

“Advanced liquid centrifuge using differentially rotating cylinders and optimized boundary conditions, and methods for the separation of fluids”

H. Ji, A. Cohen, P. Efthimion, E. Edlund, and E. Gilson

US Patent No. 10,300,410 (May 28, 2019)

“Phase contrast imaging for Wendelstein 7-X”

M. Porkolab (Principal Investigator), MIT and E. M. Edlund (co-Investigator), SUNY Cortland

submitted to: US Department of Energy, Office of Science, Office of Fusion Energy Sciences (2017)

total award: \$900k, August 2018 - August 2021, US Department of Energy

“Construction of a phase contrast imaging diagnostic for Wendelstein 7-X”

M. Porkolab (Principal Investigator) and E. M. Edlund (author and key personnel), MIT

submitted to: US Department of Energy, Office of Science, Office of Fusion Energy Sciences (2014)

total award: \$1.039M, August 2015 - August 2018

PUBLICATIONS

First Author

E. M. Edlund, “Interception and rendezvous: an intuition-building approach to orbital dynamics” *The American Journal of Physics* 89, 559 (2021).

E. M. Edlund and S. Kadas, “Visual storytelling of scientific data: collaborations between physics and graphic design in the college classroom” *The SUNY Journal of the Scholarship of Engagement* 1, article 2 (2020).

E. M. Edlund, M. Porkolab, Z. Huang, O. Grulke, L.-G. Böttger, C. von Sehren and A. von Stechow, “Overview of the Wendelstein 7-X phase contrast imaging diagnostic” *Review of Scientific Instruments* 89, 10E105 (2018).

E. M. Edlund, P. T. Bonoli, M. Porkolab and S. J. Wukitch, “Modeling of EAST ICRF heating with the full-wave code TORIC” *21st Topical Conference of Radio Frequency Power in Plasmas*, (2015).

E. M. Edlund and H. Ji, “Reynolds number scaling of the influence of boundary layers on the global behavior of laboratory quasi-Keplerian flows” *Physical Review E* 92, 043005 (2015).

E. M. Edlund and H. Ji, “Nonlinear stability of laboratory quasi-Keplerian flows” *Physical Review E* 89, 021004 (2014).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin, N. Tsujii and S. J. Wukitch, “Experimental study of reversed shear Alfvén eigenmodes during the current ramp in the Alcator C-Mod tokamak” *Plasma Physics and Controlled Fusion* 52, 115003 (2010).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin and S. J. Wukitch, “Phase contrast imaging measurements of reversed shear Alfvén eigenmodes during sawteeth in Alcator C-Mod” *Physics of Plasmas* 16, 056106 (2009).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin and S. J. Wukitch, “Observation of RSAEs during sawteeth in Alcator C-Mod” *Phys. Rev. Lett.* 102, 165003 (2009).

E. M. Edlund, M. Porkolab, G. J. Kramer, L. Lin, Y. Lin and S. J. Wukitch, “Reversed shear Alfvén eigenmodes in Alcator C-Mod during ICRF minority heating and relationship to sawtooth crash phenomena” *Proceedings of the European Physics Society Plasma Physics Conference* (2008).

Contributing Author

S. Kadas and E. M. Edlund, “A multidisciplinary collaboration between graphic design and physics classes responding to COVID-19” submitted to the *Journal of the Scholarship of Engagement: JoSE*, February 2021.

J.-P. Böhner, J. A. Alcusón, S. K. Hansen, A. von Stechow, O. Grulke, T. Windisch, H. M. Smith, Z. Huang, E. M. Edlund, M. Porkolab, M. N. A. Beurskens, S. A. Bozhnikov, O. P. Ford, N. Pablant, G. G. Plunk, A. Bañón-Navarro, F. Jenko and the W7-X Team, “Phase contrast imaging measurements and numerical simulations of turbulent density fluctuations in gas-fuelled ECRH discharges in Wendelstein 7-X” *Journal of Plasma Physics* 87, 905870314 (2021).

Z. Huang, E. M. Edlund, M. Porkolab, A. von Stechow, J.-P. Böhner, L.-G. Böttger, C. von Sehren, and O. Grulke, “The Wendelstein 7-X phase contrast imaging diagnostic” *Journal of Instrumentation* 16, P01014 (2021).

A. von Stechow, O. Grulke, T. Wegner, J. H. E. Proll, J. A. Alcusón, H. M. Smith, J. Baldzuhn, C. D. Beidler, M. N. A. Beurskens, S. A. Bozhnikov, E. M. Edlund, B. Geiger, Z. Huang, O. P. Ford, G. Fuchert, A. Langenberg, N. Pablant, E. Pasch, M. Porkolab, K. Rahbania, J. Schilling, E. R. Scott, H. Thomsen, L. Vanó, G. Weir, and the W7-X Team, “Suppression of core turbulence by profile shaping in Wendelstein 7-X” submitted to *Physical Review Letters*, April 2020.

M. J. Burin, K. J. Kaspary, E. M. Edlund, R. Ezeta, E. P. Gilson, H. Ji, M. McNulty, J. Squire and G. R. Tynan, “Turbulence and jet-driven zonal flows: Secondary circulation in rotating liquids due to asymmetric forcing” *Physical Review E* 99, 023018 (2019).

A. Marinoni, C. P. Moeller, M. Porkolab, J. C. Rost, E. M. Davis, and E. M. Edlund, “A wide frequency heterodyne detection method using the Pockels effect” *MIT Plasma Science and Fusion Center internal report*, PSFC/RR-18-3 (2018).

T. Golfopoulos, B. LaBombard, D. Brunner, J. Terry, S.-G. Baek, P. Ennever, E. Edlund, W. Han, W. Burke, S. Wolfe, J. Irby, J. Hughes, E. Fitzgerald, R. Granetz, M. Greenwald, R. Leccacorvi, E. Marmor, S. Pierson, M. Porkolab, R. Vieira, S. Wukitch, Stephen, “Edge Transport and Mode Structure of a QCM-Like Fluctuation Driven by the Shoelace Antenna” *Nuclear Fusion* 58, 056018 (2018).

A. Creely, A. White, E. M. Edlund, N. Howard, A. Hubbard, “Perturbative thermal diffusivity from partial sawtooth crashes in Alcator C-Mod”, *Nuclear Fusion* 56, 036003 (2016).

J. L. Terry, M. L. Reinke, J. W. Hughes, B. LaBombard, C. Theiler, G. M. Wallace, S. G. Baek, D. Brunner, R. M. Churchill, E. M. Edlund, P. Ennever, I. Faust, T. Golfopoulos, M. Greenwald, A. E. Hubbard, J. Irby, Y. Lin, R. R. Parker, J. E. Rice, S. Shiraiwa, J. R. Walk, S. J. Wukitch, P. Xu, “Improved confinement in high-density H-modes via modification of the plasma boundary with lower hybrid waves” *Physics of Plasmas* 22, 056114 (2015).

J. H. Rhoads, E. M. Edlund and H. Ji, “Effects of magnetic field on the turbulent wake of a cylinder in MHD channel flow” *Journal of Fluid Mechanics* 742, 446 (2014).

S. E. Sharapov, B. Alper, H. L. Berk, D. N. Borba, B. N. Breizman, C. D. Challis, I. G. J. Classen, E. M. Edlund, J. Eriksson, A. Fasoli, “Energetic particle instabilities in fusion plasmas”, *Nuclear Fusion* 53, 104022 (2013).

A. H. Roach, E. J. Spence, C. Gissinger, E. M. Edlund, P. Sloboda, J. Goodman and H. Ji, “Observation of a free-Shercliff-layer instability in cylindrical geometry” *Physical Review Letters* 108, 154502 (2012).

E. J. Spence, A. H. Roach, E. M. Edlund, P. Sloboda and H. Ji, “Free MHD shear layers in the presence of rotation and magnetic field” *Physics of Plasmas* 19, 056502 (2012).

L. Lin, M. Porkolab, E. M. Edlund, J. C. Rost, C. Fiore, M. Greenwald, Y. Lin, D. R. Mikkelsen, N. Tsujii and S. J. Wukitch, “Studies of turbulence in Alcator C-Mod H-Mode plasmas with phase contrast imaging and comparisons with GYRO” *Physics of Plasmas* 16, 012502 (2009).

L. Lin, M. Porkolab, E. M. Edlund, J. C. Rost, M. Greenwald, N. Tsujii, J. Candy, R. E. Waltz and D. R. Mikkelsen, “Studies of turbulence in Alcator C-Mod ohmic plasmas with phase contrast imaging and comparisons with GYRO” *Plasma Physics and Controlled Fusion* 51, 065006 (2009).

M. Porkolab, E. M. Edlund, L. Lin, R. Parker, C. Rost, J. Sears, J. A. Snipes, S. J. Wukitch, B. N. Breizman, N. N. Gorelenkov, G. J. Kramer, A. Fasoli and H. Smith, “Experimental studies and analysis of Alfvén eigenmodes in Alcator C-Mod” *Proceedings of the 21st IAEA Conference*, IAEA-CN 149 (2006).

L. Lin, E. M. Edlund, M. Porkolab, Y. Lin and S. J. Wukitch, “Vertical localization of phase contrast imaging diagnostic in Alcator C-Mod” *Review of Scientific Instruments* 77, 10E918 (2006).

M. Porkolab, C. Rost, N. Basse, J. Dorris, E. M. Edlund, L. Lin, Y. Lin and S. J. Wukitch, “Phase contrast imaging of waves and instabilities in high temperature magnetized fusion plasmas” *IEEE Transactions on Plasma Science* 34, 229 (2006).

N. P. Basse, E. M. Edlund, D. R. Ernst, C. L. Fiore, M. J. Greenwald, A. E. Hubbard, J. W. Hughes, J. H. Irby, G. J. Kramer, L. Lin, Y. Lin, E. S. Marmor, D. R. Mikkelsen, D. A. Mossessian, M. Porkolab, J. E. Rice, J. A. Snipes and J. A. Stillerman, “Characterization of core and edge turbulence in L- and enhanced D-alpha H-mode Alcator C-Mod plasmas” *Physics of Plasmas* 12, 052512 (2005).

E. Scime, R. Murphy, E. M. Edlund and G. Ganguli, “Electrostatic ion-cyclotron waves in a currentless, anisotropic plasma with inhomogeneous flow” *Physics of Plasmas* 10, 4609 (2003).

Publicity and Interviews

“Physics class using brand-new wind tunnel” *SUNY Cortland Bulletin* (May 4, 2021).

“Physics and graphic design students work together on COVID-19” *SUNY Cortland Bulletin* (May 19, 2020).

“SUNY Cortland’s academic odd couples address real-world problems ” *SUNY Cortland Bulletin* (May 21, 2019).

“Angular momentum transport in astrophysics and in the lab” *Physics Today* 66, 27 (August 2013).

PRESENTATIONS

Talks

“First experiments from SUNY Cortland wind tunnel” SUNY Cortland seminar, a collaborative presentation with students from PHY 357 (May 7, 2021).

“Visual storytelling of scientific data: collaborations between art and physics in the college classroom” SUNY Applied Learning Conference, Albany, NY (October 2019).

“Branches, paths, and junctions: what do electrons know of free-will?” Physics Department Colloquium, SUNY Cortland (September 2019).

“Comparison of sawtooth heat pulses across confinement regimes in Alcator C-Mod” 56th annual meeting of the APS-DPP, New Orleans, LA (2014).

“Boundary layers and global stability of laboratory quasi-Keplerian flow” 66th annual meeting of the APS-DFD, Pittsburgh, PA (2013).

“Experimental studies of turbulence lifetimes in differentially rotating flows” 65th annual meeting of the APS-DFD, San Diego, CA (2012).

“A new concept for an advanced liquid centrifuge” Savannah River National Laboratory, Director’s Colloquium (October 2012).

“Searching for a subcritical transition in quasi-Keplerian flows” 64th annual meeting of the APS-DFD, Baltimore, Maryland (2011).

“Studies of Rossby waves and hydrodynamic turbulence in a Taylor-Couette device” 63rd annual meeting of the APS-DFD, Los Angeles, California (2010).

“A new experiment for the study of hydrodynamic waves and turbulence” 52nd annual meeting of the APS-DPP, Chicago, Illinois (2010).

(invited) “Observation of reversed shear Alfvén eigenmodes during the sawtooth cycle in Alcator C-Mod” 50th annual meeting of the APS-DPP, Dallas, Texas (2008).

(invited) “Phase contrast imaging diagnostics on the Alcator C-Mod and DIII-D tokamaks” 17th Topical Conference on High-Temperature Plasma Diagnostics, Albuquerque, New Mexico (2008).

Posters

“Overview of measurements from the Wendelstein 7-X stellarator phase contrast imaging diagnostic and plans for the OP-2 campaign” 62nd annual meeting of the APS-DPP, online (2020).

“Upgrades to the Wendelstein 7-X phase contrast imaging diagnostic and plans for the OP2 campaign” European Physics Society Conference, (2020) - Cancelled.

“Observation of electron-driven Alfvén eigenmodes in Wendelstein 7-X” European Physics Society Conference, Prague, Czech Republic (2018).

“Overview of the phase contrast imaging diagnostic for Wendelstein 7-X” High Temperature Plasma Diagnostics conference, San Diego, California (2018).

“First results from the Wendelstein 7-X phase contrast imaging diagnostic” 59th annual meeting of the APS-DPP, Milwaukee, Minnesota (2017).

“Overview of the design of the phase contrast imaging diagnostic for Wendelstein 7-X” 58th annual meeting of the APS-DPP, San Jose, California (2016).

“Modeling of ICRF wave propagation and heating in EAST with the full-wave code TORIC” 57th annual meeting of the APS-DPP, Savannah, Georgia (2015).

“Recent results from the Princeton MRI and HTX experiments” 54th annual meeting of the APS-DPP, Providence, Rhode Island (2012).

“In search of a subcritical transition to turbulence in rotating hydrodynamic flows” 53rd annual meeting of the APS-DPP, Salt Lake City, Utah (2011).

“A method for minimizing secondary flows in Taylor-Couette experiments” 52nd annual meeting of the APS-DPP, Chicago, Illinois (2010).

“Diagnostic systems of the Princeton MRI Experiment” 51st annual meeting of the APS-DPP, Atlanta, Georgia (2009).

“Experimental study of reversed shear Alfvén eigenmodes during ICRF minority heating and relationship to sawtooth crash phenomena in Alcator C-Mod” 21st Transport Taskforce Workshop, Boulder, Colorado (2008).

“Reversed shear Alfvén eigenmodes in Alcator C-Mod during ICRF minority heating and relationship to sawtooth crash phenomena” 35th European Physics Society Plasma Physics Conference, Crete, Greece (2008).

“Mode structure and stability analysis of RSAEs with NOVA-K” 49th annual meeting of the APS-DPP, Orlando, Florida (2007).

“Alfvén eigenmode activity during the sawtooth phase in Alcator C-Mod” 48th annual meeting of the APS-DPP, Philadelphia, Pennsylvania (2006).

“Observation of reverse shear Alfvén eigenmodes in Alcator C-Mod and their modeling with NOVA” 47th annual meeting of the APS-DPP, Denver, Colorado (2005).

“Measurement and modeling of Alfvén cascades in Alcator C-Mod” 46th annual meeting of the APS-DPP, Savannah, Georgia (2004).

“Effects of temperature anisotropy and shear flow on ion-cyclotron instability of a magnetized plasma” 44th annual meeting of the APS-DPP, Orlando, Florida (2002).

Workshops, Discussions, and Panels

“Teaching science labs during a pandemic”, Institute for College Teaching, SUNY Cortland (November, 2020).

“Strategies for increasing student engagement in synchronous instruction”, Institute for College Teaching, SUNY Cortland (August, 2020).

“Scientists as writers: Commonalities and distinctions of writing across different disciplines”, Institute for College Teaching, SUNY Cortland (March 2020). Co-presenter with Professor Karen Downey (Chemistry, SUNY Cortland).

“Panel discussion with the artists”, Dowd Gallery *Measured Confluence* exhibition, SUNY Cortland (February 2020). Co-presenter with Professor Robert Vlasak (Jan Evangelista Purkyně University, Czech Republic) and Gallery Director Jaroslava Prihodova (Dowd Gallery, SUNY Cortland).

“Rubrics and contract grading”, SUNY Cortland Writing in the Disciplines Fellows program (January, 2020). Co-presenter with Professor Jessica Carrick-Hagenbarth (Economics, SUNY Cortland).

CREATIVE ENDEAVORS

A $b - 1$ multiplicative identity for digit summing in base b , a proof of the optimality of a base 1 counting system. August 2020.

Binary Processes, art installation in the *Measured Confluence* exhibition at the Dowd Gallery, SUNY Cortland. January-February, 2020.

Forbidden Regions, with Jaroslava Prihodova, art installation in the *Measured Confluence* exhibition at the Dowd Gallery, SUNY Cortland. January-February, 2020.

SERVICE AND ASSOCIATIONS

Current Service

Educational Policy Committee (Chair)
Physics Department Curriculum Committee (Chair)
Alumni-Undergraduate Research Science Symposium
Physics Department 3+2 Program Coordinator
Physics Department Personnel Committee
Physics Department Scholarship Committee
Physics Department Faculty Search Committee
Physics Department orientation advisor for new and transfer students
UUP area activist for Physics & Geology

Past Service

Chair, Physics Department Program Review Committee (2019-2020)
Event Coordinator, Physics Department “Celebration of Graduates” Event (2020)
Physics Department colloquium coordinator
Member, Dowd Art Gallery Director Search Committee (2018-2019), SUNY Cortland
Member, Physics Department Faculty Search Committee (2018-2019), SUNY Cortland
Member, Computational physics curriculum committee, Cal Poly (2013)
Referee, Physical Review Letters, Physics of Plasmas and Nuclear Fusion (varied)
Proposal Reviewer, High Energy Density Plasma grant proposals, Department of Energy
Colloquium Coordinator, Plasma Science and Technology Division, PPPL (2011-2013)
Treasurer, Griggstown Volunteer Fire Department, (2011-2012)
Volunteer Fire Fighter, Griggstown Volunteer Fire Department (2010-2014)
Executive Officer, MIT Club Sports Council (2007-2009)
Captain, MIT Cycling Team (2006-2007)
Tutor, MIT Office of Minority Education (2006-2007)
Vice President, CSU Chico chapter of the Society of Physics Students (2001-2003)
Tutor, CSU Chico chapter of the Society of Physics Students (1999-2003)

Associations

American Physical Society
American Association of Physics Teachers

AWARDS AND HONORS

Recipient (3 times) of the Award for Excellence in Research and Scholarship (SUNY Cortland)

Writing in the Disciplines Fellow, SUNY Cortland (2019-2020)

Fine Teaching Award, SUNY Cortland (2019)

Men of Value and Excellence (MOVE) Award, SUNY Cortland (2018)

MENTORED STUDENT RESEARCH

Spring 2022, SUNY Cortland

Student: Olivia Wilburn

Project: Heating and power alternatives for SUNY Cortland's Camp Huntington

Spring 2022, SUNY Cortland

Student: Adam Aldrich

Honor's Project: Development of PLTL/SI curricular materials for PHY 105

Fall 2021-Spring 2022, SUNY Cortland

Student: Victoria Kilfeather

Project: Experimental measurements in the CPX device

Spring 2021, SUNY Cortland

Student: Chelsea Allain

Project: Student engineering internship with Exyte Inc.

Fall 2020, SUNY Cortland

Student: Olivia Wilburn

Project: Numerical modeling of flocking behavior

Summer 2020, SUNY Cortland

Student: Hunter Reid

Project: Experimental and theoretical study of a process to create ice in the desert

Spring 2020, SUNY Cortland

Students: Scott Blankenbaker and Tyler Edgar

Project: Measurements of wave dispersion in a coupled oscillator system

Spring 2019 - present, SUNY Cortland

Student: Karl Hipius

Project: Simulation of a coupled oscillator system

Presented at the 2020 SUNY Cortland Transformations event

Summer 2018 - present, SUNY Cortland

Student: Nathaniel Rose

Project: Development of a gaussian optics program for optical design iteration

Spring 2019, SUNY Cortland

Students: Karl Hipius and Nathaniel Rose

Project: Construction of a macroscopic model of quantum mechanical systems

Presented at the 2019 SUNY Cortland Transformations event

Fall 2016 & Winter 2017, MIT

Student: Jeannette Maisano-Brown

Project: Development and testing of an arrayed light source for W7-X PCI detector calibration

Summer 2011, Princeton Plasma Physics Laboratory

Student: Michael Pretko

Project: Theoretical analysis of surface waves in rotating flows

Presented at the 2011 APS DFD Conference in Baltimore, MD

Summer 2010, Princeton Plasma Physics Laboratory

Student: Zoe Yan

Project: Measurement of the vortex lifetime in rotating flows

Fall 2009, Princeton Plasma Physics Laboratory

Student: Peter Humanik

Project: Development of a line-laser scanner for measurement of surface waves in rotating flows