David R. Smith — Curriculum Vitae

Department of Engineering Physics
University of Wisconsin-Madison
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On long-term assignment at:
Princeton Plasma Physics Lab
B206, MS15
P.O. Box 451
Princeton, NJ 08453-0451

Education

Ph.D. Plasma Physics, **Princeton University**, 2009
Dissertation: Investigation of electron gyroscale fluctuations in the National Spherical Torus Experiment (Advisor: Dr. Ernesto Mazzucato)

M.A. Plasma Physics, **Princeton University**, 2003

B.A. Integrated Science Program and Physics, **Northwestern University**, 2001

Research and Work Experience

Assistant Scientist — January 2011 – Present
Postdoctoral Research Associate — March 2009 – December 2010
Department of Engineering Physics, **University of Wisconsin-Madison**

- Beam emission spectroscopy diagnostic development to study plasma turbulence in the National Spherical Torus Experiment (NSTX) with Prof. R. J. Fonck and Dr. G. R. McKee
- Other research activities: applications of machine learning techniques to fusion science, microtearing instabilities below the ion gyroscale, plasma turbulence measurements using low coherence microwave radiation, and electron temperature gradient turbulence isotropy

Adjunct Assistant Professor — Fall Semester 2010
Department of Chemistry, Biochemistry, and Physics, **Rider University**
Instructor for PHY 200, General Physics I (calculus-based introductory physics)

Graduate Research Assistant — September 2001 – February 2009
Princeton Plasma Physics Lab, **Princeton University**

- Microwave scattering diagnostic development to study plasma turbulence in NSTX with Dr. E. Mazzucato (dissertation project)
- Analytic study of high-β helical equilibria with Dr. A. H. Reiman (theory project)
- Data acquisition development for magnetic probes with Dr. J. E. Menard (experimental project)

Undergraduate Summer Intern (DOE NUF program, 2000) — Summer 1999 and Summer 2000
Plasma Science and Fusion Center, **Massachusetts Institute of Technology**
Code development for spectroscopy and Langmuir probe diagnostics with Dr. B. Lipschultz

Undergraduate Summer Intern (NSF REU program) — Summer 1998
Department of Chemistry, **Rice University**
Laboratory work in carbon nanotube fluorination with Prof. J. L. Margrave

Undergraduate Research Assistant — Academic Years 1997-2001
Northwestern University

- Characterization of UPt3, a heavy fermion superconductor, with Prof. W. P. Halperin (Department of Physics and Astronomy)
- Data acquisition development for the D-Zero experiment at Fermilab with Prof. D. A. Buchholz (Department of Physics and Astronomy)
- Characterization of GaN semiconductors with Prof. M. Razeghi (Department of Electrical Engineering and Computer Science)

Conference Invited Talks

Investigation of ELM evolution patterns with beam emission spectroscopy measurements on NSTX-U,
21st Topical Conference on High-Temperature Plasma Diagnostics
Madison, WI (June 2016) (link)

Assessing low wavenumber pedestal turbulence in NSTX with measurements and simulations,
54th Annual Meeting of the APS Division of Plasma Physics
Providence, RI (November 2012) (link)

Investigation of electron gyroscale fluctuations in the National Spherical Torus Experiment,
14th Joint US-EU Transport Taskforce Workshop
San Diego, CA (April 2009)

Electron gyroscale fluctuations in NSTX plasmas,
50th Annual Meeting of the APS Division of Plasma Physics
Dallas, TX (November 2008) (link)

Investigation of electron gyroscale fluctuations on NSTX with millimeter-wave scattering,
16th Topical Conference on High-Temperature Plasma Diagnostics
Williamsburg, VA (May 2006)

And 25+ additional presentations at seminars and conferences (full list of presentations)

First Author and Principal Author Publications

Evolution patterns and parameter regimes in edge localized modes on the National Spherical Torus Experiment,
D. R. Smith, R. J. Fonck, G. R. McKee, A. Diallo, S. M. Kaye, B. P. LeBlanc, and S. A. Sabbagh, **Plasma Phys. Control. Fusion** 58, 045003 (2016) (link)

Measurements and simulations of low wavenumber pedestal turbulence in the National Spherical Torus Experiment,
D. R. Smith, S. E. Parker, W. Wan, et al., **Nucl. Fusion** 53, 113029 (2013) (link)

Characterization and parametric dependencies of low wavenumber pedestal turbulence in the National Spherical Torus Experiment,
D. R. Smith, R. J. Fonck, G. R. McKee, et al., **Phys. Plasmas** 20, 055903 (2013) (link)

Parametric dependencies of low-k turbulence in NSTX H-mode Pedestals,
D. R. Smith, R. J. Fonck, G. R. McKee, et al., **Proc. of the 24th IAEA Fusion Energy Conf.** (2012)

Measuring plasma turbulence using low coherence microwave radiation,
D. R. Smith, **Appl. Phys. Let.** 100, 084107 (2012) (link)

Diagnostic performance of the beam emission spectroscopy system on the National Spherical Torus Experiment,
D. R. Smith, R. J. Fonck, G. R. McKee, and D. S. Thompson, **Rev. Sci. Instrum.** 83, 10D502 (2012) (link)

Identification of microtearing modes below the ion gyroscale in the National Spherical Torus Experiment,
D. R. Smith, W. Guttenfelder, P. B. LeBlanc, and D. R. Mikkelsen, **Plasma Phys. Control. Fusion** 53, 035013 (2011) (link)

Overview of the beam emission spectroscopy diagnostic system on the National Spherical Torus Experiment,
D. R. Smith, H. Feder, R. Feder, R. J. Fonck, G. Labik, G. R. McKee, N. Schoenbeck, B. C. Stratton, I. Uzun-Kaymak, and G. Winz, **Rev. Sci. Instrum.** 81, 10D717 (2010) (link)

Electron gyroscale fluctuation measurements in National Spherical Torus Experiment H-mode plasmas,
D. R. Smith, S. M. Kaye, W. Lee, E. Mazzucato, H. K. Park, *et al.*, **Phys. Plasmas** 16, 112507 (2009) (link)

Observations of reduced electron gyroscale fluctuations in National Spherical Torus Experiment H-mode plasmas with large $E \times B$ flow shear,
D. R. Smith, S. M. Kaye, W. Lee, E. Mazzucato, H. K. Park, *et al.*, **Phys. Rev. Let.** 102, 225005 (2009) (link)

A collective scattering system for measuring electron gyroscale fluctuations on the National Spherical Torus Experiment,
D. R. Smith, E. Mazzucato, W. Lee, H. K. Park, *et al.*, **Rev. Sci. Instrum.** 79, 123501 (2008) (link)

Short Scale Turbulent Fluctuations Driven by the Electron Temperature Gradient in the National Spherical Torus Experiment,
E. Mazzucato, D. R. Smith, *et al.*, **Phys. Rev. Let.** 101, 075001 (2008) (link)

Microwave scattering system design for ρ_e-scale turbulence measurements on NSTX,
D. R. Smith, E. Mazzucato, T. Munsat, H. Park, *et al.*, **Rev. Sci. Instrum.** 75, 3840 (2004) (link)

Analytic, high-β solutions of the helical Grad-Shafranov equation,
D. R. Smith and A. H. Reiman, **Phys. Plasmas** 11, 3752 (2004) (link)

And 25+ additional co-author publications (full list of publications)

Funding

- "Diagnostic Development for Long-Wavelength Instability Exploration in Spherical Torus Plasmas", US Dept. of Energy Grant No. DE-SC0001288 (6/2016-6/2019)
  PI: G. McKee, Co-Investigators: R. Fonck and D. Smith
- "Investigations of Long-Wavelength Turbulence Properties in the Spherical Torus Configuration", US Dept. of Energy Grant No. DE-SC0001288 (6/2012-6/2016)
  PI: G. McKee, Co-Investigators: R. Fonck and D. Smith

Student Research Mentorship

- David (Matt) Kriete, U. Wisconsin-Madison (2016-present)
- Justin Weberski, PPPL SULI intern, U. Illinois at Urbana-Champaign (2015)
- Ian Stewart, PPPL SULI intern, Rutgers U.-New Brunswick (2015)
- Derek Thompson, U. Wisconsin-Madison (2010-2013)

Inventions and Patents

Plasma fluctuation measurements and imaging using low coherence radiation,
Application 13/621,916 filed September 18, 2012

Professional Activities

- University Representative, Pedestal Structure and Control Topical Science Group, NSTX-U (2015-present)
- Developer, Fusion Data Platform (project website) (2015-present)
- Participant, Data Accessibility Project, American Institute of Physics (2013)
- Member, American Physical Society
- Reviewer/referee
  - *Nuclear Fusion*
  - *Plasma Physics and Controlled Fusion*
  - *Review of Scientific Instruments*
  - *Physics Letters A*
  - *Journal of Physics B: Atomic, Molecular & Optical Physics*
- Teaching
  - *General Physics I, PHY 200* (calculus-based introductory physics), Rider University, Fall Semester, 2010
  - "Prelim" exam study group leader, Program in Plasma Physics, Princeton University, Fall Semester, 2005
  - *General Plasma Physics II, AST 552* (teaching assistant for A. Reiman and W. Tang), Princeton University, Spring Semester, 2005
  - *General Plasma Physics II, AST 552* (teaching assistant for A. Reiman and W. Tang), Princeton University, Spring Semester, 2004
  - *Plasma Waves and Instabilities, AST 553* (teaching assistant for C. Phillips), Princeton University, Fall Semester, 2003