

# Sean Bozkurt Ballinger

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## LINKS

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- Personal website: [sball.in](http://sball.in)
- LinkedIn: [linkedin.com/in/seanballinger](https://www.linkedin.com/in/seanballinger)

## EDUCATION

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**Massachusetts Institute of Technology** Cambridge, MA *May 2022*  
PhD in Applied Plasma Physics, department of Nuclear Science and Engineering  
GPA: 4.8/5

**Columbia University** New York, NY *May 2016*  
B.S. in Applied Physics, minor in Computer Science  
Overall GPA: 3.72/4, major GPA: 3.76/4

**Phillips Academy** Andover, MA *June 2012*  
High school diploma

## WORK AND RESEARCH EXPERIENCE

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**MIT Plasma Science and Fusion Center** June 2024 – Present  
*Research Scientist* Greifswald, Germany

**MIT Plasma Science and Fusion Center** May 2022 – June 2024  
*Postdoctoral Associate* Greifswald, Germany

- Collaboration with W7-X stellarator experiment in Greifswald, Germany: operated the Gas Puff Imaging diagnostic during the 2021–2022 experimental campaign and analyzing data on plasma flows in the scrape-off layer of W7-X
- Tokamak plasma edge simulations: using the SOLPS-ITER code to simulate the SPARC tokamak and detachment through impurity seeding

**MIT Plasma Science and Fusion Center** September 2016 – May 2022  
*PhD Candidate, Teaching Assistant* Cambridge, MA

- Tokamak plasma edge simulations: used the UEDGE code to simulate conditions in the SPARC tokamak design and developed an automated pipeline to simulate past experiments in MIT's Alcator C-Mod tokamak for deeper analysis
- Collaboration with W7-X stellarator experiment in Greifswald, Germany: developed an FPGA controller for a gas puff system and analyzed data from thousands of experiments to understand a 1-2 kHz oscillation in the edge of the plasma
- Teaching Assistant for Introduction to Electronics
- Grader for Introduction to Plasma Physics

**MIT Plasma Science and Fusion Center**

May – August 2015

*Research Assistant funded by the Columbia University Egleston Scholarship Cambridge, MA*

- Operated a high-speed camera imaging plasma turbulence in the X-point region
- Created tools in Python to subtract video background, filter image data, and perform Fourier, bicoherence, and correlation analysis
- Gave a Contributed Talk, “Fast Imaging of X-point Turbulence in Alcator C-Mod,” at the American Physical Society Division of Plasma Physics (APS-DPP) 2015 conference

**General Atomics DIII-D**

June – August 2014

*U.S. Department of Energy National Undergraduate Fellow**San Diego, CA*

- Added a feedback plasma control system to a Matlab simulation of the KSTAR tokamak
- Automated the tuning of PID controller gain settings for plasma control systems
- Poster on “Optimizing Plasma Control in Superconducting Tokamaks” received the Outstanding Undergraduate Poster Award at the APS-DPP 2014 conference

**Columbia Plasma Physics Laboratory**

January 2013 – Present

*Undergraduate Research Assistant**New York, NY*

- Machined and assembled parts of a capacitor bank power supply for a magnetic coil
- Created a code in Python to reconstruct the plasma current in the High-Beta Tokamak experiment from magnetic sensor data and eddy current eigenmodes

**NASA Ames Research Center**

June – August 2013

*Intern funded by New York Space Grant**Moffett Field, CA*

- Created fluid simulations of the D8 “Double Bubble” aircraft concept
- Validated the new Launch Ascent and Vehicle Aerodynamics fluid code with wind tunnel simulations
- Used Star-CCM+, Pointwise, and Overflow; ran simulations on NASA’s Pleiades supercomputer
- Wrote a 10-page report and gave a closing talk to the department

**Stony Brook University MRSEC**

June – August 2011

*High school Research Assistant**Stony Brook, NY*

- Characterized the effect of a gold nanoparticle catalyst for hydrogen fuel cell stacks
- Named a semifinalist in the 2011 Intel Science Talent Search competition

**AWARDS**

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- National Science Foundation Graduate Research Fellowship Honorable Mention, 2016
- APS-DPP Outstanding Undergraduate Poster Award, 2014
- Robert Gross Scholarship in Applied Physics, 2014–16
- NASA Aeronautics Scholarship Undergraduate Awardee, 2013–15
- Columbia University Egleston Research Scholar, 2012–16
- Intel Science Talent Search Semifinalist, 2012
- National Merit Scholarship Finalist, 2012

- Massachusetts Regional Science Bowl Semifinalist, 2012

## COURSEWORK AND SKILLS

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<b>Physics, Mathematics</b>	Statistics, ODEs, PDEs, Plasma Physics, Applied Electrodynamics, Thermodynamics, Mechanics, Electrical Engineering, Linear Algebra, Cryptography, Quantum Mechanics
<b>Computer Science</b>	Advanced Programming (C, C++), Data Structures, Computer Science Theory, Machine Learning
<b>Programming</b>	Python, C, C++, Objective-C, AppleScript, Java, JavaScript, Bash, $\text{\LaTeX}$ , HTML, CSS
<b>Software</b>	Matlab, Mathematica, Autodesk Inventor, Xilinx Vivado
<b>Hardware</b>	Red Pitaya, Arduino, Raspberry Pi

## LANGUAGES

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<b>Proficient</b>	English, French
<b>Limited working proficiency</b>	Spanish, Italian, German, Turkish

## LEADERSHIP

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- **MIT Plasma Science and Fusion Center:** tour guide, presenter, new student orientation (2017–2022)
- **MIT Edgerton House:** officer and webmaster (2017–2020)
- **Columbia Undergraduate Science Journal:** Editor in Chief (2015–16), Associate Editor (2012–15)

## PUBLICATIONS

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### First author publications

- [1] S. B. Ballinger *et al.*, “[Fast camera imaging of plasmas in Alcator C-Mod and W7-X](#),” *Nuclear Materials and Energy*, 2018.
- [2] S. B. Ballinger *et al.*, “[Dynamics and dependencies of the configuration-dependent 1–2 kHz fluctuation in W7-X](#),” *Nuclear Materials and Energy*, vol. 27, p. 100967, 2021.
- [3] S. B. Ballinger *et al.*, “[Simulation of the SPARC plasma boundary with the UEDGE code](#),” *Nuclear Fusion*, 2021.
- [4] S. Ballinger *et al.*, “[Dependence of the boundary heat flux width on core and edge profiles in Alcator C-Mod](#),” *Nuclear Fusion*, vol. 62, no. 7, p. 076020, 2022.
- [5] S. B. Ballinger, “Modeling of Boundary Transport and Divertor Target Heat Flux - Implications for Advanced Divertor Concepts,” 2022.

## Co-author publications

- [1] J. L. Terry *et al.*, “Fast imaging of filaments in the X-point region of Alcator C-Mod,” *Nuclear Materials and Energy*, Proceedings of the 22nd International Conference on Plasma Surface Interactions 2016, 22nd PSI, vol. 12, pp. 989–993, 2017.
- [2] T. Klinger *et al.*, “Overview of first Wendelstein 7-X high-performance operation,” *Nuclear Fusion*, vol. 59, no. 11, 2019.
- [3] R. A. Tinguely *et al.*, “Neutron diagnostics for the physics of a high-field, compact,  $Q \geq 1$  tokamak,” *Fusion Engineering and Design*, vol. 143, pp. 212–225, 2019.
- [4] A. J. Creely *et al.*, “Design study of a combined interferometer and polarimeter for a high-field, compact tokamak,” *Physics of Plasmas*, vol. 27, no. 4, p. 042516, 2020.
- [5] A. J. Creely *et al.*, “Overview of the SPARC tokamak,” *Journal of Plasma Physics*, vol. 86, no. 5, 2020.
- [6] A. Q. Kuang *et al.*, “Divertor heat flux challenge and mitigation in SPARC,” *Journal of Plasma Physics*, vol. 86, no. 5, p. 865860505, 2020.
- [7] P. Rodriguez-Fernandez *et al.*, “Overview of the SPARC physics basis towards the exploration of burning-plasma regimes in high-field, compact tokamaks,” *Nuclear Fusion*, vol. 62, no. 4, p. 042003, 2022.
- [8] T. S. Pedersen *et al.*, “Experimental confirmation of efficient island divertor operation and successful neoclassical transport optimization in Wendelstein 7-X,” *Nuclear Fusion*, vol. 62, no. 4, p. 042022, 2022.
- [9] C. Cowley *et al.*, “Novel SOLPS-ITER simulations of X-point target and snowflake divertors,” *Plasma Physics and Controlled Fusion*, vol. 65, no. 3, p. 035011, 2023.
- [10] J. Terry *et al.*, “The realization of a gas puff imaging system on the wendelstein 7-X stellarator,” *Review of Scientific Instruments*, 2024.