

Fredy R. Ramirez

Physics Ph.D. Candidate — University of California San Diego
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EDUCATION	University of California San Diego , San Diego, CA	2020 – Present
	Ph.D., Physics , Expected Summer 2026	
	Advisor: Professor Patrick H. Diamond	
	Dissertation: Dynamics of Staircase Formation in Cellular Flows	
	University of Colorado Boulder , Boulder, CO	2015 – 2019
	B.A. , Major in Physics, Minor in Mathematics	
	Honors: <i>Summa Cum Laude</i>	
	Thesis: <i>Numerical Modeling of a Laboratory Star</i>	
	Community College of Denver , Denver, CO	2013 – 2015
	Areas of Concentration: Mathematics and Physics	
	Thornton High School , Thornton, CO	2009 – 2013
	High School Diploma	

RESEARCH EXPERIENCE	<i>Graduate Student Researcher</i>	2021 – Present
	University of California San Diego, Department of Physics	
	PI: Professor Patrick H. Diamond — Fusion and Astrophysical Plasma Physics Group	
	• Investigate nonlinear dynamics and transport in magnetically confined plasmas. • Develop and analyze numerical models of inhomogeneous mixing and staircase formation. • Implement computational frameworks (BOUT++, Dedalus) to study passive and active scalar systems. • Contribute to collaborative frontier experiments on plasma layering and turbulence spreading: LAPD turbulent spreading and vortex crystal layering studies, and DIII-D staircase layering program, focusing on model development and data analysis.	
	<i>Research Assistant</i>	2019 – 2020
	University of Colorado Boulder, Department of Physics	
	PI: Professor Scott Parker — Plasma Physics	
	• Studied ITG/ETG isotropization mechanisms in tokamak plasmas using fluid and gyrokinetic modeling.	
	<i>Research Assistant</i>	2018 – 2020
	University of Colorado Boulder, Department of Applied Mathematics	
	PI: Dr. Nicholas Featherstone — Physical Applied Mathematics	
	• Studied 3D spherical convection and instability onset in a laboratory-scale stellar analog. • Quantified mode structure and transport through comparison with acoustically confined plasma experiments.	

University of Colorado Boulder, Department of Physics**PI: Professor Daniel Dessau — Condensed Matter Physics**

- Investigated potassium-doped *p*-Terphenyl superconductors.
- Designed cryogenic experiments using a He-3 cryostat setup.

PUBLICATIONS F.R. Ramirez and P.H. Diamond. “Staircases of Passive and Active Scalar Concentration in Cellular Flow.” *Phys. Plasmas* 32, 072302 (2025).

F.R. Ramirez and P.H. Diamond. “Layered Patterns of Active Scalar Fields in a Two-Dimensional Magnetohydrodynamic System.” *Phys. Rev. E* 111, 055107 (2025).

F.R. Ramirez and P.H. Diamond. “Staircase Resiliency in a Fluctuating Cellular Array.” *Phys. Rev. E* 109, 025209 (2024).

F.R. Ramirez and N. Featherstone. “Numerical Modeling of a Laboratory Star.” *CU Scholar* (2019).

**INVITED,
SEMINAR, &
PLENARY
TALKS**

Evolution of Layered Patterns of Active Scalar Fields — Invited 2025
JIFT Workshop on Strong Turbulence, Avalanching and Structures in Boundary Plasma Turbulence (San Diego, CA)

Dynamics of Scalar Concentration Staircases — Invited 2024
APS-DPP (Atlanta, GA)

Resiliency of Fluctuating Layered Order States — Seminar 2024
Isaac Newton Institute Layering Workshop (York, UK)

On Fluctuating Layered States — Seminar 2024
Isaac Newton Institute Layering Workshop (Cambridge, UK)

Staircase Structure in a Melting Flow — Invited 2022
AAPPS-DPP (Online)

How Turbulent Mixing Determines Staircase Structure — Plenary 2022
Transport Task Force (Madison, WI)

**GRANTS,
FELLOWSHIPS,
& AWARDS**

UCSD Distinguished Junior Graduate Teaching Award 2022

UCSD Chairs Challenge Award 2022

UCSD Bhadra Award 2020

UROP Assistantship Grant 2018

Sigma Pi Sigma Physics Honor Society 2017 – 2019

My Rights Immigration Law Scholarships 2015 - 2016

Phi Theta Kappa Honor Society 2014 - 2016

TEACHING EXPERIENCE	<i>Physics 2BL (Teaching Assistant)</i>	Spring 2022
	University of California San Diego	
	Experiments include gravitational force, linear and rotational motion, energy conservation, collisions, oscillations, and gyroscopes.	
	<i>Physics 2A (Teaching Assistant)</i>	Winter 2022
	University of California San Diego	
	Calculus-based physics covering Newtonian mechanics, energy, momentum, rotation, and gravitation.	
	<i>Physics 1AL / 1BL (Teaching Assistant)</i>	2021
	University of California San Diego	
	Introductory laboratory courses in Mechanics and Electromagnetism.	
	<i>Physics 1B / 2B (Teaching Assistant)</i>	2020
	University of California San Diego	
	Covers electric fields, circuits, magnetism, and Maxwell's equations.	

WORK EXPERIENCE	<i>Student Cohort</i>	2018 – 2019
	CU Research Computing , Boulder, CO	
	- Supported CU Boulder researchers using the Summit supercomputer and other HPC resources. - Developed documentation for software installation and resource utilization.	
	<i>DevOps and Systems Administrator</i>	2015 – 2018
	Windward Studios , Boulder, CO	
	- Managed deployment and configuration of Microsoft Azure cloud applications. - Maintained network security and internal infrastructure across Office 365 systems.	
	<i>IT College Intern</i>	2011 – 2015
	Adams 12 Five Star Schools , Thornton, CO	
	Provided desktop and server support, hardware maintenance, and staff training.	

LANGUAGES	English (Fluent)
	Spanish (Native / Fluent)

REFERENCES	Patrick H. Diamond
	Professor of Physics, University of California San Diego
	Email: phd@physics.ucsd.edu
	George R. Tynan
	Norman C. Rasmussen Adjunct Professor of Nuclear Science and Engineering, MIT
	Email: gtynan@mit.edu
	Richard D. Sydora
	Professor of Physics, University of Alberta
	Email: rsydora@ualberta.ca