JESSICA FRY

PhD Candidate, Physics — MIT Laboratory for Nuclear Science
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EDUCATION

Massachusetts Institute of Technology
Ph.D. Physics Candidate (GPA: 5.0/5.0), Laboratory for Nuclear Science

Stanford University
B.S. in Physics (GPA: 3.93/4.0), Minor in Theater and Performance Studies

AWARDS

2026 Forbes 30 Under 30
2021 NSF Graduate Research Fellowship
2020 Hoefer Prize for Undergraduate Writing
2020 Stanford Major Grant

PUBLICATIONS

TIDMAD: Time Series Dataset for Discovering Dark Matter with AI Denoising
J. T. Fry et. al., NeurIPS 2025, 121748 (2025) **NeurIPS Spotlight Paper**

High-Frequency Gravitational Wave Search with ABRACADABRA-10 cm
Kaliroë M. W. Pappas, **J. T. Fry** et. al., arXiv:2505.02821. In preparation.

Systematic Approach to Understanding Noise Sources in ABRACADABRA-10cm
ABRACADABRA Collaboration (including J. T. Fry) In preparation.

Cryogenic Design of DMRadio-50L
DMRadio Collaboration (including J. T. Fry) In preparation.

Electromagnetic modeling and science reach of DMRadio-m^3
DMRadio Collaboration (including J. T. Fry), Phys. Rev. D 112, 052001 (2025)

Noise limits for dc SQUID readout of high-Q Resonators below 300 MHz
DMRadio Collaboration (including J. T. Fry), J. Appl. Phys. 138, 094505 (2025)

Long Time Series Data Release from Axion Dark Matter Experiment
J. T. Fry et. al., NeurIPS ML4FS 2023, 131 (2023)

Projected sensitivity of DMRadio-m^3: A search for the QCD axion below 1 μeV
DMRadio Collaboration (including J. T. Fry), Phys. Rev. D 106, 103008 (2022)

Proposal for a definitive search for GUT-scale QCD axions
DMRadio Collaboration (including J. T. Fry), Phys. Rev. D 106, 112003 (2022)

RESEARCH EXPERIENCE

DMRadio and **ABRACADABRA** under Prof. Lindley Winslow 2021 - present
Lead ABRA-Grav detector calibration to characterize quantum amplifier pipeline. Designed, manufactured, and tested DMRadio-50L thermo-mechanical hardware including detectors lowest temperature stage. Designed, implemented, and tested a calibration procedure of DMRadio-50L amplifier chain. Co-Lead of DMRadio-50L analysis pipeline. Performed vibration analysis of DMRadio m^3 copper coaxial pickup. Leads ABRACADABRA-ML operations.

AI for Rare Event Searches (AIRES) 2023 - present
Leads inter-institution collaboration for the development of AI data processing in rare event physics searches. NeurIPS publication — dataset released, created benchmarks, and ML models for dark matter data denoising of time series data. Development of time series denoising algorithms for physics searches.

HPS Experiment with SIMPS Analysis under Prof. Lauren Tompkins 2020 - 2021
Performed an analysis on the Heavy Photon Search (HPS) for the Strongly Interacting Massive Particle (SIMP). Conducted analysis on Monte Carlo simulated SIMP data and background to find dark matter signal using

phenomenology based cuts. Performed tracking analysis to determine track reconstruction algorithm with highest signal purity and lowest fake rates.

Optimal Quantum Control under Prof. Monika Schleier-Smith 2020

Conducted research in the Schleier-Smith Lab on the application of machine learning and CRAB optimization techniques to classical and quantum optimization problems. Wrote simulation and optimization scripts in Python to create software for the optimization of cold atom transport with a dipole beam between experimental regions.

ATLAS Experiment with Emerging Jets Analysis under Prof. Lauren Tompkins 2017

Performed a preliminary optimization for emerging jets analysis searching for the dark sector in ATLAS data. Wrote scripts in C++ using ATLAS Root software to create a cutflow for Monte Carlo simulated data and background, optimizing discriminating variables for the emerging jets search.

LZ Experiment at SLAC under Dr. Daniel Akerib 2016

Repaired the SLAC system test detector between circulation runs including reconstruction of the weir reservoir, the purification tower, and additions to the programmable logic computer. Conducted an individual experiment characterizing the cooling power of the LZ thermosyphon system. Designed, built, and ran a detector with thermosyphon lines, vacuum chamber, thermometers, and heaters.

INVITED SEMINARS

11/2025	**Yale** Nuclear Particle Astrophysics Seminar
11/2025	**Harvard** Laboratory for Particle Physics and Cosmology Seminar
12/2025	**University of San Diego** Particle Physics Seminar

SELECTED CONFERENCE PRESENTATIONS

2025	NeurIPS Conference (Spotlight)
2025	Patras Wavy Dark Matter Conference
2025, 2023	UCLA Dark Matter Conference
2024	APS April Meeting
2023	CMB Core to Core Conference
2023	TAUP

OTHER PROFESSIONAL EXPERIENCE

2017	Broadway: M. Butterfly
2018	Television: The Americans Ep. 605
2019	First National Tour: Charlie and the Chocolate Factory

LEADERSHIP

Student Seminar Organizer, MIT Laboratory for Nuclear Science 2025 - present

Organize and coordinate the student seminar series, inviting speakers and facilitating research exchange

Journal Club Organizer, MIT Neutrinos & Dark Matter Groups 2024 - present

Lead weekly journal club on neutrino and dark matter physics, fostering critical discussion

Admissions Committee Member, MIT Summer Research Program 2023 - present

Select undergraduates for MIT's summer research program from underrepresented background

Graduate Open House Coordinator, MIT Laboratory for Nuclear Science 2023 - present

Organize student participation, outreach, and programming for LNS graduate recruitment events

Research Mentor 2021 - present

Mentored five undergraduates on research projects in the Winslow Lab

GSE Stanford Summer Program Counselor 2020, 2021

Counselor for underprivileged high school girls teaching programming through STEM applications

TECHNICAL SKILLS

Programming Languages Python, C++, ROOT, Bash
ML & Statistics neural networks design, PyTorch, TensorFlow, Monte Carlo simulation, benchmark development
Cryogenic Systems dilution fridge operations (BlueFors, Oxford), superconducting magnets, SQUID readout
Mechanical Design & Simulation Fusion360, COMSOL, FEA thermal/structural analysis
Science Communication Invited seminars at Harvard, Yale, UCSD, 10+ conference presentations, grant writing