Eleanor Hall

Graduate student in particle theory

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Berkeley Center for Theoretical Physics, University of California, Berkeley, CA 94720, USA
Theoretical Physics Group, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA

Education

University of California, Berkeley
August 2018 – present
Doctoral student
Advisor: Hitoshi Murayama

Massachusetts Institute of Technology
August 2014 – June 2018
Bachelor of Science in Physics
Thesis Advisor: Jesse Thaler
Thesis: Photon Isolation and Jet Substructure

Awards and Fellowships

Doug Tuttle and Lynn Brantley Fellowship
Berkeley Center for Theoretical Physics, 2021

Graduate Research Fellowship Program
National Science Foundation, 2018

Joel Matthew Orloff Award for Service
MIT Department of Physics, 2017

History Undergraduate Writing Prize
MIT History, 2017

Publications

Non-perturbative methods for false vacuum decay
with Djuna Croon and Hitoshi Murayama
[arXiv:2104.10687]

Asymmetric Matters from a Dark First-Order Phase Transition
with Thomas Konstantin, Robert McGehee, and Hitoshi Murayama
[arXiv:1911.12342]

Baryogenesis From a Dark First-Order Phase Transition
with Thomas Konstantin, Robert McGehee, Hitoshi Murayama, and Géraldine Servant
JHEP **2004**, 042 (2020) [arXiv:1910.08068]

Photon isolation and jet substructure
with Jesse Thaler
JHEP **1809**, 164 (2018) [arXiv:1805.11622]

Presentations

Invited talks

False vacuum decay in strongly-interacting dark sectors
Aspen Center for Physics winter workshop: A Rainbow of Dark Sectors, March 25, 2021.

Other Conference Talks

Non-perturbative methods for false vacuum decay
Strong and Electroweak Matter, June 30, 2021.

Matter Through the Looking Glass
University of Tokyo, Berkeley Week at Kavli IPMU, January 14, 2020.

Anisotropic Dielectric Tensors in 2D Heterostructures
MIT, Harvard-MIT Undergraduate Physics Research Conference, October 1, 2016.

Seminars

Non-perturbative methods for false vacuum decay
UC Berkeley, BCTP 4D Seminar, April 26 2021.

Matter Through the Looking Glass
UC Berkeley, BCTP 4D Seminar, June 15, 2020.

Photon Isolation and Jet Substructure
MIT, LHC/BSM/DM Journal Club, September 29, 2017.

Research experience

Berkeley Center for Theoretical Physics
Advisor: Hitoshi Murayama (February 2019 – Present)
Completed **–** *With Djuna Croon and Hitoshi Murayama:* started and led an international collaboration. Originated and developed a new, non-perturbative formalism for false vacuum decay based on the functional renormalization group which is robust to strong interactions. *With Thomas Konstandin, Robert McGehee, Hitoshi Murayama, and Geraldine Servant:* developed new models for baryogenesis in which the standard model baryon asymmetry is the result of electroweak-like baryogenesis in a hidden dark sector. ***Ongoing*** **–** *With Djuna Croon:* performing in-depth analyses of our false vacuum decay formalism at finite temperature and more extensive field content. Applying our methods to QCD and QCD-like theories to make the first reliable predictions of gravitational wave signals from chiral phase transitions. *With Djuna Croon and Rachel Houtz:* setting new warm dark matter constraints on axions using the functional renormalization group.

MIT Center for Theoretical Physics
Advisor: Jesse Thaler (February 2017 – June 2018)
Developed "soft drop isolation," a new collinear-safe, democratic photon isolation criterion based on jet substructure techniques. Applied soft drop isolation to develop the "isolated photon subjet," a jet substructure observable that identifies hard photon prongs within jets. Using this observable, we were for the first time able to directly expose the QED splitting function in PYTHIA data.

MIT Laboratory for Nuclear Science
Advisor: Janet Conrad (February 2017 – May 2017)
Built pocket-sized muon detectors for the Cosmic Watch program. These muon detectors were provided to high school students as kits to educate about particle physics and to teach valuable shop skills.

Institute for Soldier Nanotechnologies
Advisor: Marin Soljacic (June 2016 – December 2016)
Built computational models for simulation of Van der Waals heterostructures using novel Wannier function techniques. Found anisotropic dielectric effects in simulated graphene-hBN metamaterials.

MIT Nuclear Reactor Laboratory
Advisor: Boris Khaykovich (June 2015 – August 2015)
Developed C libraries to simulate reflective neutron optics. Designed and optimized neutron optics for a focusing neutron microscope. Participated in neutron guide testing at Oak Ridge National Laboratory (ORNL).

Teaching Experience

Berkeley Physics 111B: Advanced Experimental Lab
Graduate Student Instructor, spring 2019

Berkeley Physics 8.B: Introductory Physics 2
Graduate Student Instructor, fall 2018

MIT 8.13: Junior Lab
Undergraduate Teaching Assistant, fall 2017 and spring 2018

Leadership and Service

Identity and Gender Spectrum (IGenSpectrum)
UC Berkeley, 2019 – present.

MIT Society of Physics Students
Secretary, June 2017 – May 2018
Vice President, June 2016 – May 2017

MIT Physics Code of Conduct Committee
2016-2018