

Carlos Blanco

ASSISTANT PROFESSOR, PENN STATE UNIVERSITY

✉ carlosblanco@psu.edu | 📧 GammaCascade/GCascade

Personal Information

Ph.D. in 2020

Nationality: Colombia & USA

- INSPIREHEP: [C.BLANCO.2](#)
- GOOGLE SCHOLAR: [0000-0002-0175-247X \(ORCID\)](#)
- PERSONAL SITE: [DR.CARLOSBLAN.CO](#)

Born 17 Dec. 1992

Current Position

The Pennsylvania State University, Department of Physics

State College, NJ, USA

ASSISTANT PROFESSOR, INSTITUTE FOR COMPUTATIONAL AND DATA SCIENCES CO-HIRE

January 2025 – Present

Postdoctoral Positions

Princeton University

Princeton, NJ, USA

ASSOCIATE RESEARCH SCHOLAR (VISITING RESEARCHER 2025 - PRESENT)

January 2021 – Dec. 2024

Department of Physics

Stockholm University

Stockholm, Sweden

POSTDOCTORAL FELLOW (VISITING RESEARCHER 2021 - PRESENT)

June 2020 – January 2021

Oskar Klein Centre - Dep. of Physics

Education

University of Chicago

Chicago, IL, USA

NSF GRADUATE RESEARCH FELLOW: PH.D. IN PHYSICS & M.S. IN PHYSICS

Sept. 2015 – May 2020

- Thesis: Gamma-Cascade: A Simple Program To Compute Cosmological Gamma-Ray Propagation
- Doctoral advisor: Dan Hooper

Purdue University

West Lafayette, IN, USA

B.S. IN PHYSICS & B.C. IN CHEMISTRY (ACS CERT.)

Sept. 2011 – June 2015

Fellowships and Awards

2024 Research Corporation for Science Advancement Fellow

RCSA, USA

2021 – 2023 NASA Hubble Fellowship Einstein Postdoctoral Fellow

NASA, USA

2017 – 2020 NSF Graduate Research Fellowship Graduate Researcher

NSF, USA

Organization & Responsibilities

Seminar - GAPP

Penn State University

ORGANIZER

2025-Present

Seminar - Dark Cosmos

Princeton University

ORGANIZER

2021-2024

Workshop on Quantum Probes of Wave-like and Sub-GeV Dark Matter

Princeton University

ORGANIZER

Fall 2023

Workshop on Cosmological and Astrophysical Probes of New Physics

Princeton University

ORGANIZER

Spring 2022

Statistics

42 Articles & Letters

(25 accepted, 9 in review, 8 whitepapers)

inspire: **1,326 citations**, Google Scholar h-index: **19**

Teaching and Lecturing

PHYS 410 - Introduction to Quantum Mechanics

LECTURER

The Pennsylvania State University

Spring 2026

PHYS 214 - Wave Motion and Quantum Physics

CO-LECTURER

The Pennsylvania State University

Fall 2025

PHYS 213 - Fluids and Thermal Physics

CO-LECTURER

The Pennsylvania State University

Fall 2025

High School Student Outreach (ZAPP)

GUEST TEACHER

Burnside HS, Burnside, New Zealand.

2022–Present

Physics, Chemistry, Biology, Environmental Science

GUEST TEACHER

Holy Ghost school, Chicago, IL

2018–2019

Major Collaborations

The QUAntum dot Dark matter Recoil detection with Abalone photosensors (QUADRA) Collaboration

2022 – Present

FOUNDATIONAL DESIGN, THEORY, AND PHENOMENOLOGY

Founding Member

DarkDot Collaboration

2022 – Present

FOUNDATIONAL DESIGN, THEORY, AND PHENOMENOLOGY

Founding Member

Daily modulation with an Intrinsically ANisotropic Array (DIANA) Collaboration

2023 – Present

FOUNDATIONAL DESIGN, THEORY, AND PHENOMENOLOGY

Founding Member

The Windchime Project Collaboration

2020 – 2023

FOUNDATIONAL THEORY AND PHENOMENOLOGY

Member

The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) Collaboration

2015 – 2017

THEORY AND PHENOMENOLOGY

Member

Research with Students and Mentorship

Allison Chevis

PhD Faculty Advisor

THE PENNSYLVANIA STATE UNIVERSITY

2025 — Present

Graduate Student

Rohan Arni

Research Advisor

HIGH TECHNOLOGY HIGH SCHOOL

2024 — Present

High School Student

Active Grants/Applications

Liverpool Impact Acceleration Exercise

Awarded 2022

MOLECULAR SCREENING WITH ML FOR DARK MATTER AND PROTEIN BINDING

£2,050

PI: Juri Smirnov, Co-I: Carlos Blanco

Office of Undergraduate Research (Hewlett Foundation)

Awarded 2024

TIME-DEPENDENT SIGNATURE OF BSM PHYSICS IN AGN

\$6,300

PI: Carlos Blanco, Co-I: Matias Andia

UK-RI (Medical Research Council) Future Leaders Fellowship

Awarded 2024

CLOSING IN ON DARK MATTER WITH SUPERFLUIDS AND QUANTUM TECHNOLOGY

£197,205

PI: Juri Smirnov, Co-I: Carlos Blanco & others

Research Corporation for Science Advancement

Awarded 2024

FELLOWS INITIATIVE

Non-monetary

PI: Carlos Blanco

Publications

A Numerical Method for the Efficient Calculation of Scattering Form Factors

Carlos Blanco, Benjamin Lillard, Jack D. Shergold

(Dec. 2025). 2025, arXiv: **2512.18010** (hep-ph)

Sub-GeV Dark Matter Detection with Dark Rates in Liquid Scintillators

Lillian Santos-Olmsted, Rebecca K. Leane, Carlos Blanco, John F. Beacom

SLAC-PUB-251210 (Dec. 2025). 2025, arXiv: **2512.13779** (hep-ph)

Using Deep Learning for Robust Classification of Fast Radio Bursts

Rohan Arni, Carlos Blanco, Anirudh Prabhu

(Nov. 2025). 2025, arXiv: **2511.02634** (astro-ph.HE)

Physics-Informed Neural Networks with Fourier Features and Attention-Driven Decoding

Rohan Arni, Carlos Blanco

NeurIPS 2025 AI for Science Workshop arXiv:2510.05385 (Sept. 2025). arXiv, 2025, arXiv: **2510.05385** (cs)

The Impact of Muon and Pion Cooling on the Neutrino Spectrum of NGC 1068

Carlos Blanco, Dan Hooper, Tim Linden, Elena Pinetti

(Sept. 2025). 2025, arXiv: **2509.15421** (astro-ph.HE)

Complementary Planetary Spectroscopy Probes of Dark Matter

Carlos Blanco, Rebecca K. Leane, Marianne Moore, Joshua Tong

SLAC-PUB-250609, MIT-CTP/5749 (Aug. 2025). 2025, arXiv: **2508.00980** (hep-ph)

Community Report from the 2025 SNOLAB Future Projects Workshop

MD Diamond, P Abbamonte, A Arvanitaki, DM Asner, D Balut, D Baxter, C Blanco, D Boreham, M Boulay, B Broerman, et al.

SNOLAB-STR-2025-006, FERMILAB-PUB-25-0469-ETD-PPD (July 2025). 2025, arXiv: **2507.11368** (hep-ex)

Searching for Axion Dark Matter near Relaxing Magnetars

Sandip Roy, Anirudh Prabhu, Christopher Thompson, Samuel J. Witte, Carlos Blanco, Jonathan Zhang

DESY-25-050 (May 2025). 2025, arXiv: **2505.20450** (hep-ph)

Dark Matter Velocity Distributions for Direct Detection: Astrophysical Uncertainties Are Smaller than They Appear

Dylan Folsom, Carlos Blanco, Mariangela Lisanti, Lina Necib, Mark Vogelsberger, Lars Hernquist

Physical Review Letters 135.21 (Nov. 2025) p. 211004. 2025, arXiv: **2505.07924** (hep-ph)

Looking for the Gamma-Ray Cascades of the KM3-230213A Neutrino Source

Milena Crnogorčević, Carlos Blanco, Tim Linden

JCAP 10 (Oct. 2025) p. 009. 2025, arXiv: **2503.16606** (astro-ph.HE)

Deep Learning Optimal Molecular Scintillators for Dark Matter Direct Detection

Cameron Cook, Carlos Blanco, Juri Smirnov

Physical Review D: Particles and Fields 112.8 (Oct. 2025) p. 083005. 2025, arXiv: **2501.00091** (hep-ph)

Search for Dark Matter Induced Airglow in Planetary Atmospheres

Carlos Blanco, Rebecca K. Leane, Marianne Moore, Joshua Tong

MIT-CTP/5748, SLAC-P-24001 (Aug. 2024). 2024, arXiv: **2408.15318** (hep-ph)

γ -Cascade V4: A Semi-Analytical Code for Modeling Cosmological Gamma-Ray Propagation

Antonio Capanema, Carlos Blanco

Computer Physics Communications 307 (Oct. 2024) p. 109408. 2024, arXiv: **2408.03995** (astro-ph.HE)

Search for Dark Matter Ionization on the Night Side of Jupiter with Cassini

Carlos Blanco, Rebecca K. Leane

Physical Review Letters 132.SLAC-PUB-17753 (June 2024) p. 261002. 2024, arXiv: **2312.06758** (hep-ph)

Sensitivity of JWST to eV-Scale Decaying Axion Dark Matter

Sandip Roy, Carlos Blanco, Christopher Dessert, Anirudh Prabhu, Tea Temim

Physical Review Letters 134.7 (Feb. 2025) p. 071003. 2025, arXiv: **2311.04987** (hep-ph)

Constraining Dark Matter-Proton Scattering from Molecular Cloud Ionization

Carlos Blanco, Ian Harris, Yonatan Kahn, Anirudh Prabhu

Physical Review D: Particles and Fields 110.3 (Aug. 2024) p. 035006. 2024, arXiv: **2311.00740** (hep-ph)

Limits on Dark Matter Annihilation in Prompt Cusps from the Isotropic Gamma-Ray Background

M. Sten Delos, Michael Korsmeier, Axel Widmark, Carlos Blanco, Tim Linden, Simon D. M. White

Physical Review D: Particles and Fields 109.8 (Apr. 2024) p. 083512. 2024, arXiv: **2307.13023** (astro-ph.HE)

Neutrino and Gamma-Ray Emissions from NGC 1068

Carlos Blanco, Dan Hooper, Tim Linden, Elena Pinetti

Physical Review D: Particles and Fields 112.FERMILAB-PUB-23-469-T (Dec. 2025) p. 123016. 2025, arXiv: **2307.03259** (astro-ph.HE)

Where Are the Cascades from Blazar Jets? An Emerging Tension in the γ -Ray Sky

Carlos Blanco, Oindrila Ghosh, Sunniva Jacobsen, Tim Linden

(Mar. 2023). 2023, arXiv: **2303.01524** (astro-ph.HE)

Particle Physics at the European Spallation Source

Hartmut Abele, Androula Alekou, Alejandro Algora, K Andersen, Stefan Baeßler, Libertad Barron-Pálos, J Barrow, Eric Baussan, Phillip Bentley, Zurab Berezhiani, et al.

1023 (July 2023) pp. 1–84. 2023, arXiv: **2211.10396** (physics.ins-det)

Constraints on Dark Matter-Electron Scattering from Molecular Cloud Ionization

Anirudh Prabhu, Carlos Blanco

Physical Review D: Particles and Fields 108.3 (Aug. 2023) p. 035035. 2023, arXiv: **2211.05787** (hep-ph)

Molecular Migdal Effect

Carlos Blanco, Ian Harris, Yonatan Kahn, Benjamin Lillard, Jesús Pérez-Ríos

Physical Review D: Particles and Fields 106.11 (Dec. 2022) p. 115015. 2022, arXiv: **2208.09002** (hep-ph)

Dark Matter Direct Detection with Quantum Dots

Carlos Blanco, Rouven Essig, Marivi Fernandez-Serra, Harikrishnan Ramani, Oren Slone

Physical Review D: Particles and Fields 107.9 (May 2023) p. 095035. 2023, arXiv: **2208.05967** (hep-ph)

Snowmass2021 Cosmic Frontier: The Landscape of Low-Threshold Dark Matter Direct Detection in the next Decade

Rouven Essig, Graham K Giovanetti, Noah Kurinsky, Dan McKinsey, Karthik Ramanathan, Kelly Stifter, Tien-Tien Yu, A Aboubrahim, D Adams, DSM Alves, et al.

FERMILAB-CONF-22-181-PPD (Mar. 2022). 2022, arXiv: **2203.08297** (hep-ph)

Snowmass2021 Cosmic Frontier White Paper: Ultraheavy Particle Dark Matter

Daniel Carney, Nirmal Raj, Yang Bai, Joshua Berger, Carlos Blanco, Joseph Bramante, Christopher Cappiello, Maíra Dutra, Reza Ebadi, Kristi Engel, et al.

SciPost Phys. Core 6.FERMILAB-PUB-22-160-T (Nov. 2023) p. 075. 2023, arXiv: **2203.06508** (hep-ph)

Snowmass 2021 White Paper: The Windchime Project

Alaina Attanasio, Sunil A Bhawe, Carlos Blanco, Daniel Carney, et al.

(Mar. 2022). 2022, arXiv: **2203.07242** (hep-ex)

Snowmass2021-LOI Direct Detection of Spin-independent and Spin-dependent Nuclear Scattering of Sub-GeV Dark Matter Using Molecular Excitations and Superconducting Nanowire Single-Photon Detectors

Carlos Blanco, Ranny Budnik, Rouven Essig, Eden Figueroa, et al.

(Mar. 2022). 2022

A Next-Generation Liquid Xenon Observatory for Dark Matter and Neutrino Physics

Jelle Aalbers, SS AbdusSalam, K Abe, V Aerne, F Agostini, S Ahmed Maouloud, DS Akerib, D Yu Akimov, J Akshat, AK Al Musalhi, et al.

Journal of Physics G: Nuclear and Particle Physics 50.INT-PUB-22-003, FERMILAB-PUB-22-112-PPD-QIS-T (Dec. 2022) p. 013001. 2022, arXiv: **2203.02309** (physics.ins-det)

Models of Ultraheavy Dark Matter Visible to Macroscopic Mechanical Sensing Arrays

Carlos Blanco, Bahaa Elshimy, Rafael F. Lang, Robert Orlando

Physical Review D: Particles and Fields 105.11 (June 2022) p. 115031. 2022, arXiv: **2112.14784** (hep-ph)

Dark Matter Daily Modulation with Anisotropic Organic Crystals

Carlos Blanco, Yonatan Kahn, Benjamin Lillard, Samuel D. McDermott

Physical Review D: Particles and Fields 104.FERMILAB-PUB-21-066-T (Aug. 2021) p. 036011. 2021, arXiv: **2103.08601** (hep-ph)

Star-Forming Galaxies Provide a Larger Contribution to the Isotropic Gamma-Ray Background than Misaligned Active Galactic Nuclei

Carlos Blanco, Tim Linden

JCAP 02 (Feb. 2023) p. 003. 2023, arXiv: **2104.03315** (astro-ph.HE)

Dark Matter-Electron Scattering from Aromatic Organic Targets

Carlos Blanco, J. I. Collar, Yonatan Kahn, Benjamin Lillard

Physical Review D: Particles and Fields 101.5 (Mar. 2020) p. 056001. 2020, arXiv: **1912.02822** (hep-ph)

Z' Mediated WIMPs: Dead, Dying, or Soon to Be Detected?

Carlos Blanco, Miguel Escudero, Dan Hooper, Samuel J. Witte

JCAP 11.FERMILAB-PUB-19-331-A, KCL-2019-61 (Nov. 2019) p. 024. 2019, arXiv: **1907.05893** (hep-ph)

Annihilation Signatures of Hidden Sector Dark Matter within Early-Forming Microhalos

Carlos Blanco, M. Sten Delos, Adrienne L. Erickcek, Dan Hooper

Physical Review D: Particles and Fields 100.FERMILAB-PUB-19-249-A (Nov. 2019) p. 103010. 2019, arXiv: **1906.00010** (astro-ph.CO)

Constraining Sterile Neutrino Interpretations of the LSND and MiniBooNE Anomalies with Coherent Neutrino Scattering Experiments

Carlos Blanco, Dan Hooper, Pedro Machado

Physical Review D: Particles and Fields 101.FERMILAB-PUB-19-019-A-T (Apr. 2020) p. 075051. 2020, arXiv: **1901.08094** (hep-ph)

Constraints on Decaying Dark Matter from the Isotropic Gamma-Ray Background

Carlos Blanco, Dan Hooper

JCAP 03.FERMILAB-PUB-18-627-A (Mar. 2019) p. 019. 2019, arXiv: **1811.05988** (astro-ph.HE)

γ -Cascade: A Simple Program to Compute Cosmological Gamma-Ray Propagation

Carlos Blanco

JCAP 01 (Jan. 2019) p. 013. 2019, arXiv: **1804.00005** (astro-ph.HE)

Novel Gamma-Ray Signatures of PeV-scale Dark Matter

Carlos Blanco, J. Patrick Harding, Dan Hooper

JCAP 04.FERMILAB-PUB-17-568-A, LA-UR-17-31003 (Apr. 2018) p. 060. 2018, arXiv: **1712.02805** (hep-ph)

High-Energy Gamma Rays and Neutrinos from Nearby Radio Galaxies

Carlos Blanco, Dan Hooper

JCAP 12.FERMILAB-PUB-17-203-A (Dec. 2017) p. 017. 2017, arXiv: **1706.07047** (astro-ph.HE)

Letter of Intent: The Accelerator Neutrino Neutron Interaction Experiment (ANNIE)

I Anghel, JF Beacom, M Bergevin, C Blanco, E Catano-Mur, F Di Lodovico, A Elagin, H Frisch, J Griskevich, R Hill, et al.

FERMILAB-LOI-1063 (Apr. 2015). 2015, arXiv: **1504.01480** (physics.ins-det)

Novel Synthetic Methodology for Controlling the Orientation of Zinc Oxide Nanowires Grown on Silicon Oxide Substrates

Jinhyun Cho, Najah Salleh, Carlos Blanco, Sungwoo Yang, Chul-Jin Lee, Young-Woo Kim, Jungsang Kim, Jie Liu

Nanoscale 6.7 (2014) p. 3861. 2014

Modeling HIF Relevant Longitudinal Dynamics in UMER

B.L. Beaudoin, S. Bernal, C. Blanco, I. Haber, R.A. Kishek, T. Koeth, Y. Mo

Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 733 (Jan. 2014) pp. 178–181. 2014

Reviewing Activities

Journal Referee

2021 – Present

PHYSICAL REVIEW D, NEURIPS ML4SCIENCE , JOURNAL OF COSMOLOGICAL ASTROPHYSICS

FINNEST Grant Panel Reviewer

2023

NASA

Starting Grant Remote Reviewer

2024 – Present

EUROPEAN RESEARCH COUNCIL

Software Development

γ -Cascade: A Simple Program to Compute Cosmological Gamma-Ray Propagation

2018 – Present

github.com/GammaCascade/GCascade

A publicly available Mathematica package that semi-analytically computes the effects of electromagnetic interactions during astrophysical gamma-ray transport.

Membership Of Scientific Societies

American Physical Society (APS)

2023 – Present

Summer Schools & Programs

ICTP School on Particle Physics

2019

Theoretical Advanced Study Institute in Elementary Particle Physics (TASI)

2018

Service and Outreach

Ψ -dea: Project Condor

2016 – Present

CO-FOUNDER

Research is conducted to develop novel water quality sensors to be used as teaching and environmental monitoring tools in high school classrooms across the amazon region in Colombia.

Society of Physics Students

2012 – 2015

PRESIDENT AND VICE-PRESIDENT

Purdue Univ.

General supervision of all society research projects and outreach activities.

Engineers Without Borders

2011 – 2012

PRESIDENT

Purdue Univ.

Supervision, development, implementation of a water distribution system for a community of 135 families in Papachacra, Bolivia.