

Kerstin M. Perez

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EDUCATION

California Institute of Technology, Pasadena, CA

Ph.D., Physics 2011

M.S., Physics 2008

Columbia University, New York, NY

B.A., Physics, Minor in Mathematics 2005

POSITIONS

Assistant Professor of Physics 2015 - present

Haverford College, Haverford, PA

NSF Postdoctoral Fellow 2012 - 2014

Columbia University, New York, NY

Postdoctoral Research Scientist, 2011 - 2012

Columbia University, New York, NY

Graduate Research Assistant, 2006 - 2011

California Institute of Technology, Pasadena, CA

CERN Laboratories, Geneva, Switzerland

AWARDS AND GRANTS

Cottrell College Science Award (RSCA) 2015 - 2017

NSF Astronomy and Astrophysics Postdoctoral Fellowship 2012 - 2014

NSF US LHC Graduate Student Support Award 2010 - 2011

Robert A. Millikan Graduate Fellowship 2006 - 2007

Magna Cum Laude from Columbia University 2005

RESEARCH EXPERIENCE

Antideuteron signatures of dark matter with GAPS 2011 - present

Head of detector development for the GAPS experiment, a balloon-borne indirect dark matter search utilizing low-energy antideuterons:

- Direct detector design and fabrication for the Si(Li) tracking system. Develop process and facility to produce and test low-cost, high-performance semiconducting Si detectors

suitable for X-ray spectroscopy.

- Responsible for detailed schedule, budget, and personnel and equipment plans for full-scale production of final flight detectors.
- Contribute to simulation studies to optimize instrument design.
- Contributed to the analysis, preparations, and operations of the prototype GAPS flight from Taiki, Japan in June 2012, in particular tasks relating to the X-ray calibration and thermal sub-systems.

High-energy emission from the Galactic Center with NuSTAR 2011 - present

Perform analysis of Galactic Center data from the NuSTAR hard X-ray observatory:

- Led discovery and analysis of high-energy X-ray emission from the Galactic Center, specifically its relation to stellar population densities, diffuse emission from cosmic ray interactions, previously identified gamma-ray and TeV sources, and possible signatures of dark matter annihilation.
- Contributed to observation planning and object analysis in the broader Galactic Center region.

Commissioning and initial data analysis with ATLAS 2006 - 2011

Contributed to commissioning and first physics results of the ATLAS experiment, one of the two multi-purpose detectors at the Large Hadron Collider (LHC) at CERN:

- Thesis analysis: Led the first ATLAS measurements of the inclusive cross section for the production of hadronic jets at the LHC. Advisor: Prof. Emlyn Hughes.
- Commissioned the hardware and software of the silicon pixel detector, the innermost tracking sub-detector of ATLAS, from its initial calibration phase until its successful operation during LHC activity. On-call expert for the data-acquisition system during initial LHC data-taking. Responsible for design of automated threshold calibration analysis.
- Optimized ATLAS analyses of hadronic jets by performing first *in-situ* measurement of jet reconstruction efficiency; validating the Monte Carlo-based jet energy scale calibration using analysis of direct p_T balance in photon-jet events; measuring initial jet trigger efficiencies with collision data; piloting optimization of the jet trigger thresholds; and installing and documenting ATLAS-wide software to produce theoretical cross section calculations for hadronic jet production.
- Involved in early studies of the feasibility of a search for supersymmetry in the fully-hadronic channel with early ATLAS data.

Materials Research Center, Columbia University 2003 - 2005

Research Assistant with Prof. Jeffrey Kysar

Nevis Laboratories, Columbia University Summer 2004

ATLAS REU student with Prof. John Parsons

Physics Department, Columbia University 2002 - 2003

Research Assistant in nanotechnology laboratory with Prof. Philip Kim

TEACHING AND MENTORING EXPERIENCE

Physics Department, Haverford College 2015 - present

Instructor for Phys 301 (Laboratory in Quantum Physics); research advisor for Rui Fan, Andrea Gaughan, Cora Hersch, Jiayue Wan (2015-present).

The Double Discovery Center, Columbia University 2012 - 2014

Designed and led a course exposing students in grades 9-11 to modern scientific research in the Columbia community through invited lectures, hands-on laboratory activities, and interviews; in partnership with the DDC, which provides tutoring and academic guidance to low-income and first-generation college-bound students in Manhattan.

Columbia Astrophysics Lab, Columbia University 2011-present

Mentor and develop research programs for undergraduates from the physics, applied physics, engineering, and astronomy departments on various GAPS projects:

Justin Ripley (2011-2012), Walid Ahmad (2011-2012), Megan McGregor (2012-2013), Andrew Brickman (2013-2014), Glenn Kewley (2013-present), Sarah Mechbal (2013-present), Jason Williams (2014-present).

CERN Summer Student Program Summer 2008

Supervised two undergraduate students as they constructed a cosmic-ray trigger for pixel detector testing; as part of a pilot program to engage Middle Eastern countries at CERN.

Junior Achievement of Delaware Valley 2005 - 2006

Led volunteer training, teacher recruitment, and students sessions for the Junior Achievement program, which teaches basic math, writing, and financial skills to middle school students.

TestTakers, Inc. 2004-2006

Taught preparation for all sections of the SAT to classes of 10-15 students.

East Harlem Tutorial Program 2003-2005

Tutored 7th-8th grade student in math and writing.

Astronomy Department, Columbia University 2003

Physics Department, Columbia University 2004 - 2005

Grading assistant for undergraduate courses in introductory relativity and cosmology; and introductory mechanics, quantum waves, electricity, and magnetism.

SELECT PRESENTATIONS AND SEMINARS

- *Antideuteron Signatures of Dark Matter with the GAPS Experiment.*
Colloquium at MIT, Cambridge, MA, March 2015.
Seminar at University of Chicago, Chicago, IL, February 2015.
Colloquium at Lehigh University, Bethlehem, PA, December 2014.

- *My Path Towards BIG PHYSICS.*
Keynote speech at Young Women’s Conference, Princeton University, Princeton, NJ, March 2015.
- *Particle Fever: A Special Particle Physics Experience for the Public.*
Public documentary viewing, “virtual visit” with CERN, and Q&A, Haverford College, Haverford, PA March 2015.
- *Galactic Center Diffuse Emission.*
Presentation in NuSTAR special session at AAS HEAD division meeting, Chicago, IL, August 2014.
- *Results from NuSTAR.*
Invited presentation at 26th Rencontres de Blois on Particle Physics and Cosmology, Blois, France, May 2014.
- *Future Astroparticle Searches for Dark Matter.*
Invited overview at Latest Results in Dark Matter Searches Workshop, NORDITA, Stockholm, Sweden, May 2014.
- *Unsolved Problems in Astrophysics: Particle Searches for Dark Matter.*
Guest lecture for CUNY Honors course, AMNH, New York, NY, May 2014.
- *Antideuteron Signatures of Dark Matter with the GAPS Experiment.*
Seminar at MIT, Boston, MA, April 2014.
- *Morphology of the Galactic Center with NuSTAR.*
Seminar at MIT, Boston, MA, April 2014.
- *Antideuteron Signatures of Dark Matter with the GAPS Experiment.*
Physics Colloquium at Northeastern University, Boston, MA, April 2014.
- *NuSTAR’s View of the Galactic Center.*
Public lecture at the Rolnick Observatory, Westport, CT, February 2014.
- *Morphology of the Galactic Center with NuSTAR.*
Poster presented at American Astronomical Society 222nd Meeting, Washington, D.C., January 2014.
- *Searching for Dark Matter Using Cosmic-Ray Antideuterons: the GAPS Experiment.*
Seminar at Harvard University, Cambridge, MA, December, 2013.
- *Progress on Large-Scale, Low-Cost Si(Li) Detector Fabrication for the GAPS Balloon Mission.* Poster presented at IEEE Nuclear Science Symposium and Medical Imaging Conference, Seoul, South Korea, October-November 2013.
- *The GAPS Experiment: Hunting for Dark Matter with Antideuterons.*
Presentation at 33rd International Cosmic Ray Conference, Rio de Janeiro, Brazil, July 2013.
- *Why Dark Matter Matters: The Invisible Universe.*
Public lecture at Columbia University, New York, NY, May 2013.
- *NuSTAR: High-Energy Messages from the Center of the Galaxy.*
Public lecture at the Rolnick Observatory, Westport, CT, March 2013.

- *Searching for Dark Matter with GAPS.*
Presentation at NSF AAPF Symposium, Long Beach, CA, January 2013.
- *Sagittarius A* Observations with NuSTAR.*
Poster presented at the American Astronomical Society 221st Meeting, Long Beach, CA, January 2013.
- *Jet Cross Section Measurements in ATLAS.*
Presentation at the Implications of First LHC Data Workshop, Boston, MA, August 2010.
- *Choice of Jet Algorithms in ATLAS.*
Presentation at International School of Subnuclear Physics, Erice, Italy, September 2009.

SELECT PUBLICATIONS AND REPORTS

- K. Perez et al., *Extended hard-X-ray emission in the inner few parsecs of the Galaxy*, Nature, **520** 646-649 (2015).
- T. Aramaki, et al. (K. Perez and P. v. Doetinchem editors), *Theoretical and Experimental Status of Cosmic-Ray Antideuteron Searches for Dark Matter*, submitted to Physics Reports (2015).
- K. Mori, et al., *Hard X-ray Morphology and Spectroscopy of the Galactic Center Surveyed by the NuSTAR Telescope*, in preparation (2015).
- K. Perez et al., *Results from the NuSTAR High-Energy X-ray Mission*, Proceedings of the 26th Rencontres de Blois on Particle Physics and Cosmology (2014).
- T. Aramaki et al., *Potential for Precision Measurement of Low-Energy Antiprotons with GAPS for Dark Matter and Primordial Black Hole Physics*, Astropart. Phys., **59** 12-17 (2014).
- K. Perez et al., *Progress on Large-Scale, Low-Cost Si(Li) Detector Fabrication for the GAPS Balloon Mission*, Proceedings of IEEE Nuclear Science Symposium and Medical Imaging Conference (2013).
- M. Nynka et al., *High-Energy X-rays from J174545.5-285829, the Cannonball: A Candidate Pulsar Wind Nebula Associated with Sgr A East*, Astrophys. J. Lett., **778** L31 (2013).
- K. Perez et al., *The GAPS Experiment: Hunting for Dark Matter with Antideuterons*, Proceedings of 33rd International Cosmic Ray Conference (2013).
- P. von Doetinchem et al., *The flight of the GAPS prototype experiment*, Astropart. Phys., **54** 93-109 (2014).
- S.A.I. Mognet et al., *The Prototype GAPS (pGAPS) Experiment*, Nucl. Inst. Meth. A, **735** 24-38 (2014).
- H. Fuke, R. Ong, et al., *The pGAPS experiment: an engineering balloon flight of prototype GAPS*, Advances in Space Research, **53** 1432-1437 (2014).

- The ATLAS Collaboration, *Jet energy measurement with the ATLAS detector in proton-proton collisions at $\sqrt{s}=7$ TeV*, Eur. Phys. J. **C73**, 2304 (2013).
- The ATLAS Collaboration, *Measurement of inclusive jet and dijet production in pp collisions at $\sqrt{s} = 7$ TeV using the ATLAS detector*, Phys. Rev. D **86**, 014022 (2012).
- The ATLAS Collaboration, *Determination of the ATLAS jet energy measurement uncertainty using photon-jet events in proton-proton collisions at $\sqrt{s} = 7$ TeV*, ATLAS-CONF-2011-031, CERN (2011), For the 46th Rencontres de Moriond on QCD and High Energy Interactions, La Thuile, Italy, March 2011.
- The ATLAS Collaboration, *Jet energy scale and its systematic uncertainty in proton-proton collisions at $\sqrt{s} = 7$ TeV in ATLAS 2010 data*, ATLAS-CONF-2011-032, CERN (2011), For the 46th Rencontres de Moriond on QCD and High Energy Interactions, La Thuile, Italy, March 2011.
- The ATLAS Collaboration, *Measurement of inclusive jet and dijet cross sections in proton-proton collisions at 7 TeV centre-of-mass energy with the ATLAS detector*, Eur. Phys. J. **C71** 1-59 (2011).
- The ATLAS Collaboration, *The ATLAS Inner Detector commissioning and calibration*, Eur. Phys. J. **C70** 787-821 (2010).
- The ATLAS Collaboration, *Jet energy resolution and reconstruction efficiencies from in-situ techniques with the ATLAS Detector Using Proton-Proton Collisions at a Center of Mass Energy $\sqrt{s}= 7$ TeV*, ATLAS-CONF-2010-056, CERN (2010), For the 35th International Conference on High Energy Physics, Paris, France, July 2010.
- The ATLAS Collaboration, *Performance of the ATLAS Jet Trigger in the Early $\sqrt{s} = 7$ TeV Data*, ATLAS-CONF-2010-094, CERN (2010).
- The ATLAS Collaboration, *Threshold Tuning of the ATLAS Pixel Detector*, ATL-INDET-PUB-2010-001, CERN (2010).
- J. Small, K. Perez, P. Kim, *Modulation of Thermoelectric Power of Individual Carbon Nanotubes* Phys. Rev. Lett. **91** (2003) 256801.