

Sean Quinn

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Education

- Ph.D. Experimental Astroparticle Physics (GPA 3.92/4), Case Western Reserve Univ., Jan. 2018
 - [Arrival Direction Probabilities of Ultra High Energy Cosmic Rays with the Pierre Auger Observatory and Progress Toward an in-situ Cross-calibration of Auger and Telescope Array Surface Detector Stations](#)
- M.S. Physics (GPA 3.92/4), Case Western Reserve Univ., 2015.
- B.S. Physics (GPA 3.64/4), Rochester Institute of Technology, 2011.

Employment

Postdoctoral Scholar, University of California, Los Angeles, 2018-present

- Electronics lead for the development of a relativistic particle time of flight system
- Architected high bandwidth, low power, 12 layer mixed signal data acquisition board using a Zynq 7000 SoM and specialized fast sampling ASIC
 - Expert knowledge/experience with DRS4 switched capacitor array ASIC
 - Contributed several improved revisions of board design (Altium Designer), including procurement of PCB fab and assembly with multiple domestic vendors
 - Lead and worked with small team of firmware engineers to develop custom ASIC control, DMA engine, data acquisition and packetization Verilog and VHDL code
 - Lead and contributed to software development (C, Python) for board DAQ and calibration modes as well as continuous monitoring (temp. and env. sense)
 - Extensive debugging experience fixing defects: rotated parts, I2C bus out of spec, large caps on clock lines, power on sequencing, reset sequencing, etc.
 - Familiar with Xilinx tools/work flow, building with Vivado and debugging with hardware server/manager and ILAs
 - Implemented git VCS system (GitLab hosted) for all aspects of development: Altium project, firmware and software and created Confluence workspace for troubleshooting
- Supervised, debugged, optimized and characterized silicon photomultiplier (SiPM) preamp.
- Construction of automated moderate throughput electrical and optical test stand for SiPM preamps (wrote Arduino sketches for stepper motor control and Python code for lab instrumentation control)
- Consultant for design of isolated multirail (analog, digital and medium voltage) power distribution board
- Contributed software for analysis of muon pulse data (lab testing source)

- Contributed Geant4 code (C++) for the time of flight geometry
- Contributed code for realistic response of time of flight electronics for Geant4 simulations

Grad. Student/Research Assistant, Case Western Reserve University, 2012-2017

- Data acquisition system for Pierre Auger surface detector stations embedded in the Telescope Array (super giant cosmic ray air shower arrays)
 - Construction of custom SBC (RPI + adapters) for communication, control and continuous DAQ for surface detector (RS-232)
 - Implementation of comparator circuit for custom triggering of adjacent station for high rate showers (“local trigger”)
 - Contributed software for real time comparison of UTC microsecond timestamps between Pierre Auger and Telescope Array events (C, Python)
 - Contributed software for unpacking binary data and generating calibrated signal outputs and analysis of outputs (Python)
 - Contributed software for simulating events observed in with field with the CORSIKA and Auger Offline frameworks (C++, Python, bash)
- Characterizing and quantifying the uncertainty of a large parameter space (32) galactic magnetic field model for use in arrival direction studies of ultrahigh energy cosmic rays
 - Modification of “CRT” (C++) numerical B-field solver to allow parameter sampling
 - Modification of “CRPropa” (Python) B-field solver to allow parameter sampling: more powerful framework that includes turbulent fields
 - Sensitivity analysis for a publicly available set of Pierre Auger arrival directions (Python)
 - Maintained several Dell PowerEdge blade servers in mini data center to help with high compute demand

Dept. of Energy Internship, Los Alamos National Laboratory, Summer 2011

- Using ALTAIR radar data to characterize micrometeoroid orbits
 - Wrote MATLAB code to extract trajectory from radar range-time plots
 - Fit mixed 2D Gaussians to characterize orbit populations
 - Contributed code for beam and atmospheric effects to generate debiased flux map

NSF REU, Bucknell University, Summer 2010

- Analysis of X-ray light curves from active galactic nuclei
 - Diagnostic tests: power spectral density, log-normal fitting, time reversibility, Kolmogorov-Smirnov tests (Python)

Faculty sponsored research, Rochester Institute of Technology, Summer 2009

- Studying AGN nebulae kinematics
 - Continuum subtraction and fitting of mixed Gaussians to hydrogen spectral emission lines (Igor Pro)

College of Science Summer Research Scholar, Rochester Institute of Technology, Summer 2008

- Studying AGN nebulae kinematics

Technical Skills

Programming

- Compiled languages: C, C++, make, CMake
- Python
 - Scientific: numpy, scipy, matplotlib, pyroot, lmfit, astropy
 - Machine learning: scikit-learn, pandas
- Scripting: bash, tcl
- Analysis: R, Matlab, Mathematica, ROOT (particle physics)
- Operating systems: Linux (Debian/Ubuntu), Windows
- Revision control: git, subversion
- Laboratory instrumentation: SCPI, GPIB
- Misc/other: HTML & CSS, LAMP stack, nginx, AWS & cloud, sysadmin, MediaWiki

Electronics design

- Schematic capture, layout & routing, BOM and CAM file generation (Altium Designer)
- Manufacturing: PCB fab and board loading with multiple domestic vendors
- Simulation: LTSpice
- High bandwidth analog signals (500 MHz)
- Digital systems

Fabrication

- Mechanical
 - Mill
 - Lathe
 - Vertical saw
 - Drill press
- Electronics
 - THT soldering
 - SMT soldering: iron/heat gun
 - Cable crimping
 - * Coax (LMR-200, RG58)
 - * Lugs for power cable
 - * Quick connect

Hardware experience

- Electronics
 - Discriminators and comparators
 - Analog front ends: instrumentation op-amps, transimpedance amplifiers
 - Serial communication: I2C, UART
 - GPS receivers and timing modules
 - Function generators, pulse generators, frequency counters
 - Oscilloscopes: Tektronix, USB (Picoscope)
 - Zynq 7000 SoC
 - Spartan 7 FPGA
 - Raspberry Pi, Arduino
- Particle physics detectors and methods
 - Scintillator
 - Water Cherenkov
 - Photomultipliers: Vacuum tube based (PMT), Silicon (SiPM)
 - Coincidencing
- Computing
 - Networking: routers, switches
 - Web hosting: nginx, mediawiki

Peer Reviewed Publications

Journal Articles

- Phase I of Auger at Telescope Array (Auger@TA) *in-situ* surface detector cross-calibration, Pierre Auger Collaboration, Telescope Array Collaboration, in prep. for submission to *JCAP*
- Cosmic antihelium-3 nuclei sensitivity of the GAPS experiment, N. Saffold et al., *Astroparticle Physics*, **130**:102580, 2021
- Cosmic-ray antinuclei as messengers of new physics: status and outlook for the new decade, P. von Doetinchem et al., *Journal of Cosmology and Astroparticle Physics*, **2020**:035, 2020
- Pierre Auger publications:
 - <http://inspirehep.net/search?p=exactauthor%3AS.Quinn.1&sf=earliestdate>
- **Nicmos Polarimetry of Polar Scattered Seyfert 1 Galaxies**, D. Batcheldor, A. Robinson, D.J. Axon, S. Young, S. Quinn, J.E. Smith, J. Hough, D.M. Alexander. *The Astrophysical Journal*, **738**:90-98, 2011.

Proceedings

- Recent Progress on the GAPS Time of Flight System, S. Quinn et al., *Proc. of 36th Intl Cosmic Ray Conference, Madison, Wisconsin, USA*
- GAPS: A New Cosmic Ray Anti-matter Experiment, S. Quinn et al., *CIPANP 2018 Proceedings*, 2018.
- Auger at the Telescope Array: toward a direct cross-calibration of surface-detector stations, S. Quinn et al., *Proc. of 35th Intl Cosmic Ray Conference, Busan, KR*, 2017.
- Auger at the Telescope Array: Recent Progress Toward a Direct Cross-Calibration of Surface-Detector Stations, S. Quinn et al., *Proc. of 2016 UHECR Conference, Kyoto, JP*, 2016.
- [Initial result of a direct comparison between the Surface Detectors of the Pierre Auger Observatory and the Telescope Array](#), R. Takeishi et al. *Proc. of 34th Intl Cosmic Ray Conference, The Hague, NL*, 2015.

Pierre Auger Internal Documents

- A Monte-Carlo study of arrival direction uncertainty for the highest energy Herald events using the JF12 model, S. Quinn and C. Covault. *Pierre Auger internal letter (GAP)*, **2016**, 012, 2016.

Awards

- APS FGSA Travel Award 2016
- CWRU Graduate Dean's Award for Instructional Excellence 2013
- Astronomical Society of New York Research Paper Prize 2011
- RIT Department of Physics Distinguished Research Scholar 2011
- Julia A. and Charles F. Cala Nathaniel Rochester Society Scholarship 2009

Contributed Oral Presentations

- *Kavli Institute for Cosmological Physics: [Auger@TA: current progress and future plans](#)* (2016)
- *Ettore Majorana Center Int'l School for Cosmic Ray Astrophysics: The turbulent galactic magnetic field* (2014)
- *217th Meeting of the American Astronomical Society: Non-linear Variability in 3C390.3* (2011)
- *Los Alamos Nat'l Lab 11th Student Symposium: Investigating the Origin of Sporadic Meteors* (2011)
- *Astronomical Society of New York Spring Meeting: Detailed Nebular Diagnostics for the Host Galaxy of E1821+643* (2011)
- *Dept. of Physics (RIT) Capstone Presentation: Exploring the Nebulae of an Interesting Active Galaxy* (2011)
- *Bucknell Dept. of Physics and Astronomy REU Talk: Non-Linear Variability in 3C 390.3* (2010)
- *College of Science (RIT) Annual Undergraduate Research Symposium: Investigating the Structure of AGN by Means of Comparing H α in Total and Polarized Flux* (2009).

- *College of Science (RIT) Weekly Research Seminar: Probing AGN Inner Structure Using Polarized Light* (2009), *Using Spectroscopy to Detect Gas Flows Around Supermassive Black Holes* (2008).
- *College of Science (RIT) Annual Undergraduate Research Symposium: Using Spectroscopy to Detect Gas Flows Around Supermassive Black Holes* (2008).

Teaching

UCLA

- Physics 180F: Experimental Particle Physics, spring 2020
Co-instructor for first ever “remote” version of class. Contributed to modified curriculum, created muon detector kits students could assemble along with a guide for data acquisition. Spring 2020.

CWRU

- Intro. Mechanics and EM lab , spring 2017
 - Supervisor
- Modern Physics, fall 2015, 2016
 - Recitation leader
- Intro. Mechanics lab, fall 2011, spring 2012
 - Teaching assistant

RIT

- Intro. Physics I, spring 2010
 - Teaching assistant

Professional workshops

- [Codes in Astroparticle Research School](#), September 2014, Hamburg, Germany
- Int'l School of Cosmic Ray Astrophysics 19th Course: Exploring the High Energy Universe, July 2014, Erice, Italy
- Cottrell Scholars Collaborative National Teaching Assistant Workshop, May 2014, Atlanta, GA

Volunteer/service activities and outreach

- [The high energy astrophysics display](#): Programmed and created content for kiosk that allows visitors to interactively learn about cosmic rays and the Pierre Auger observatory. (Fall 2013)
- *Church of the Covenant Saturday Morning Tutoring Program, CWRU*: Tutor high school students in math and physics. (Oct 2012–Jan 2013)

- *Proposal Reviewer, CWRU*: Evaluated undergraduate research proposals. Written feedback was also provided to the students. (Feb 2012, 2013)
- *Rochester Roots*: Assisted a local community food group with environmental research and database building to improve donor support. (September–November 2010)

Professional Affiliations

- Sigma Pi Sigma, Physics Honor Society, May 2011—
- American Physical Society, Early Career Member, August 2010—
- American Astronomical Society, Junior Member, August 2010—2015

References

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| • Prof. Corbin Covault (CWRU) <ul style="list-style-type: none">– PhD Advisor– <code>cec8@case.edu</code> | • Robert Halliday, PhD (MSU) <ul style="list-style-type: none">– Coworker– <code>hallid15@msu.edu</code> |
| • Prof. Frederic Sarazin (CSM) <ul style="list-style-type: none">– PhD Advisor– <code>fsarazin@mines.edu</code> | • Jeff Johnsen (CSM) <ul style="list-style-type: none">– Coworker– <code>jjohnsen@mines.edu</code> |
| • Robert Sobin, EE (CWRU) <ul style="list-style-type: none">– Coworker– <code>robert.sobin@case.edu</code> | • Prof. Kevin Marshall (Widener) <ul style="list-style-type: none">– REU advisor– <code>kbmarshall@widener.edu</code> |
| • Prof. John Ruhl (CWRU) <ul style="list-style-type: none">– PhD committee member, professor– <code>john.ruhl@case.edu</code> | • Prof. Andy Robinson (RIT) <ul style="list-style-type: none">– Undergraduate research advisor– <code>axrsps@rit.edu</code> |

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