

# ROBERT CRAIG GROUP

## Curriculum Vitae

### Office Address

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### RESEARCH EXPERIENCE

**Associate Professor of Physics** : University of Virginia 2016 – present  
Research on the Mu2e and NOvA experiments at Fermilab. Leader of the fabrication effort for the Mu2e cosmic-ray-veto system which is being fabricated at UVA. Our focus on the NOvA experiment is shifting from exotic searches to contributions to mainstream neutrino analyses with the hope of answering major questions in neutrino physics with the full NOvA data set. Member of the LDMX collaboration that has proposed a new accelerator-based light dark matter experiment.

**Assistant Professor of Physics** : University of Virginia 2010 – 2016  
(Associate Scientist at Fermilab – position is joint with Fermilab)  
Research with leadership positions on the CDF, Mu2e, and NOvA experiments at Fermilab: level-3 manager of the fabrication effort of the cosmic-ray-veto system on the Mu2e experiment; convener for the computing effort on the NOvA experiment; and leader of the low-mass Higgs boson search at the CDF experiment where evidence was first reported for a Higgs boson-like particle decaying to  $b$ -quark pairs.

**Research Associate:** Fermilab 12/2006 – 8/2010  
Major contributions to the first observation of electroweak top quark production and the search for the Higgs boson produced in association with a  $W$  boson. Coordinated the simulation for for the Higgs Discovery Group and served as convener for the Single Top and  $WH \rightarrow \ell\nu b\bar{b}$  analysis groups. Also directed students on cosmic-ray-veto studies for the Mu2e experiment, and on a search for Higgs bosons decaying into two photons.

### EDUCATION

**Ph.D. in Physics, Dec. 2006. (GPA=4.0)** Gainesville, FL  
University of Florida, Advisor: Richard D. Field and Konstantin Matchev  
Thesis: *Inclusive Jet Production using the Midpoint Algorithm in Run II at CDF*

**M.S. in Physics, Aug. 2001. (GPA=3.8)** Tallahassee, FL  
Florida State University, Advisor: Harrison B. Prosper

**B.A. in Physics, May 1999.** Due West, SC  
Erskine College

## RECENT RESEARCH HIGHLIGHTS

Mu2e Experiment: 2009 - present

**Management of CRV fabrication effort**: May 2010 - present

UVA lead the design and is leading the construction of a detector that will be used to veto false signals in the Mu2e experiment caused by cosmic rays muons. We have been constructing this major detector system and I am the manager of the fabrication effort (in total, the CRV project cost is  $\sim$ \\$10M).

**R&D efforts for the CRV detector**: 2009 - present

Led group members (postdoc, technicians and students) on assembly and commissioning of prototype cosmic ray veto detectors for the Mu2e experiment. These efforts included several test-beam runs at Fermilab, studies of the properties of fiber and photodetectors, and measurements and simulations of the effects of neutron radiation on the CRV detector.

Light Dark Matter Experiment (LDMX): 2018 - present

**Design and Fabrication efforts for the Hadronic Calorimeter**: May 2019 - present

UVA joined LDMX in 2018. The plan is to use similar technology to the Mu2e CRV to fabricate the hadronic calorimeter. We are working to design, fabricate, and test prototypes for this proposed accelerator-based dark matter experiment. In addition we are investigating the use of visible signature to further expand the hunt for dark matter at LDMX.

NO $\nu$ A Experiment: 2012 - present

**Convener of the computing effort**: 2012 - 2015

Worked to streamline the computing environment so the processing of the first experimental data will be successful. I lead several post-doctoral researches and graduate students on these computing efforts. I estimated required resources for the experiment and negotiate with the Fermilab computing division and laboratory management on behalf of the NO $\nu$ A spokespeople.

**Dark Matter Searches at NO $\nu$ A**: 2012 - 2021

I led the effort to use the NO $\nu$ A detector as a neutrino telescope to search for dark matter annihilation in the center of the Sun. I assembled a team that studied the feasibility of this search and implemented a trigger for upward-going muons that is also be useful for atmospheric neutrino studies. My student completed the first dark matter search at NO $\nu$ A and documented it in her Ph.D. thesis.

## PAST RESEARCH HIGHLIGHTS

CDF Experiment:

**Single Top and Higgs boson work** 2008 - 2014

- Co-convener of the single top group (2008-2009)
- Observation of electroweak single top production (2009)
- First observation of  $s$ -channel single top quark production (2014)
- Co-convener of the Higgs Analysis Group (2011-2012)
- First evidence for a new particle (consistent with the Higgs boson) in the  $b\bar{b}$  decay mode (2012)

**QCD studies** 2005 - 2009

- Measured the inclusive jet cross section for the first time with a cone algorithm.
- Measured the properties of the underlying event in CDF collisions.

## FUNDING HISTORY

**Approximate total DOE and project funds for my efforts (2010-2024) – \$5M**

- **DoE UVA Intensity Frontier task – \$1,300,000:** 2021-2024  
(~1/2 of this support is for my efforts, \$650k)
- **DoE UVA Intensity Frontier task – \$1,600,000:** 2018-2021  
(~2/5 of this support is for my efforts, \$700k)
- **DoE UVA Intensity Frontier task – \$1,500,000:** 2015-2018  
(~2/5 of this support is for my efforts, \$650k)
- **DoE UVA Intensity Frontier task – \$1,100,000:** 2012-2015  
(~1/3 of this support is for my efforts, \$400k)
  
- **Mu2e Project Award \$4,200,000:** FY2013-FY2020  
(~1/2 of this support is for my efforts \$2M)
  
- **R&D for LDMX – \$70,000:** 2020-2023  
(~1/2 of this support is for my efforts \$35k)
  
- **DoE supplementary for CDF experiment – \$58,000:** 2011-2013

### Start-up funds:

- **UVA – \$250,000:** 2010-2013
- **Fermilab (travel and summer Salary) ~ \$100,000:** 2010-2015

### PPRA Summer Program:

- **Jefferson Trust grant – \$28,800:** 2012-2015
- **Fermilab support – ~\$25,000:** 2012-2015

### Other:

- **URA Visiting Scholar Award (M. Solt) – \$20,000:** 2022-2023
- **DOE SCGSR Fellowship, A. Sutton – \$36k + travel** 2018-2019
- **Page-Barbour Grant – \$10,000:** 2016-2017 (PI)
- **HEET equipment funds – \$110,000:** 2000-2016 (+1 co-PI)
- **URA Visiting Scholar Award (Y. Oksuzian) – \$20,000:** 2011-2012
- **Mead Honored Faculty – \$3000:** 2012
- **Dean’s travel awards – \$7000:** 2012-2020
- **Undergraduate and graduate student travel awards – ~\$10,000:** 2011-2019
- **Undergraduate summer Mitchell fellowships – ~\$50,000:** 2011-2022

## HONORS AND AWARDS

|  |                   |
|--|-------------------|
| <b>American Physical Society Career Mentoring Fellow</b><br>Mentorship program at the APS April meeting.   | 2022              |
| <b>The European Physics Society: The High Energy and Particle Physics Prize</b><br>To the CDF and DO Collaborations for the discovery of the top quark and the detailed measurement of its properties.                           | 2019              |
| <b>2nd place research award: Joint Institute of Nuclear Research, Russia</b><br>"Innovative method of light yield rising for scintillating detectors of Mu2e experiment", A.Artikov, D.Chokheli, C.Dukes, V.Glagolev, C.Group... | 2019              |
| <b>SPS Outstanding Chapter Advisor Award Finalist</b><br>I was honored to be nominated twice by our SPS students for this national award.  | 2017 and 2018     |
| <b>Cory Family Teaching Award</b><br>Annual award recognizing excellence in undergraduate instruction at UVA.  | 2015              |
| <b>Recognized at Terman Award Receptient Banquet</b><br>Recognized as outstanding pre-college mentor for award receptient, Stanford.   | 2013              |
| <b>Mead Honored Faculty Recipient</b><br>Project for undergraduate students to explore and develop physics demos.  | 2012              |
| <b>Outstanding Mentor Award</b><br>DOE Office of Science, for mentoring students on the CDF experiment.  | 2009              |
| <b>Alumni Fellowship</b><br>Department of Physics, University of Florida.  | 08/2002 – 08/2006 |
| <b>Marsh W. White Award (Sigma Pi Sigma)</b><br>Design of a Foucault pendulum to be publicly displayed at Erskine College  | 1999              |

## MENTEE HONORS AND AWARDS

|   |      |
|---|------|
| <b>Matt Solt : URA Visiting Scholar Award (for post-doc)</b><br>University Research Alliance to support efforts at Fermilab     | 2022 |
| <b>Lincoln Curtis: Best Undergraduate Speaker Award</b><br>South Easter Section of APS (SESAPS)                                 | 2022 |
| <b>Matt Solt: Best PosterAward</b><br>NuFact: International Workshop on Neutrinos from Accelerators                             | 2022 |
| <b>Sydney Roberts: Best Undergraduate Speaker Award</b><br>Annual Meeting of the Virginia Academy of Science                    | 2022 |
| <b>Andrew Sutton: 2nd Outstanding Graduate Research Award in Physics</b><br>Department of Physics, University of Virginia       | 2022 |
| <b>Andrew Sutton: DOE SCGSR Fellowship</b><br>Department of Energy, Office of Science   | 2018 |
| <b>Peter Farris: Best Undergraduate Speaker Award</b><br>Annual Meeting of the Virginia Academy of Science                      | 2018 |
| <b>Steven Stetzler: Steve Thornton Undergraduate Research Award</b><br>Department of Physics, University of Virginia            | 2018 |
| <b>Sophia Xiao: Steve Thornton Undergraduate Research Award</b><br>Department of Physics, University of Virginia                | 2014 |
| <b>Yuri Oksuzian : URA Visiting Scholar Award (for post-doc)</b><br>University Research Alliance to support efforts at Fermilab | 2011 |
| <b>David Abbot :Award for Best Undergraduate Oral Presentation</b><br>South Eastern section of APS (SESAPS), Roanoke, VA        | 2011 |

## LEADERSHIP

**Level-2 Manager, Operations Planning for CRV of the Mu2e experiment** (2019 -)  
**Level-3 Manager, Fabrication for Cosmic Ray Veto of the Mu2e experiment** (2011 -)  
**Collaboration Board, LDMX Collaboration** (2019-)  
**Chair, Speaker's Board, LDMX Collaboration** (2019-)  
**Deputy Level-2 Manager, Cosmic Ray Veto of the Mu2e Experiment** (2015)  
**Computing Convener, NOvA experiment** (2012-2015)  
**Elected member of the Fermilab Users' Executive Committee** (2012 - 2014)  
-- > Secretary (2013-2014)  
-- > Quality of Life, Users' Meeting, and Government Relations subcommittees  
**Executive Board member for the CDF Experiment** (2011 - 2014)  
**Higgs Analysis Group co-convener of CDF Experiment** (2011 - 2013)  
**WH and Single Top sub-group convener of CDF Experiment** (2008 - 2011)  
**Philomathean Literary Society, President** (1999, Erskine College), Vice President (1998)  
**Kappa Mu Epsilon, President** (1999, Erskine College)

## COMMUNITY SERVICE

**Councilor**, Virginia Academy of Science, Astronomy, Math, and Physics Section, 2021-  
**Scientific Program Committee**, Workshop on Neutrinos from Accelerators (NuFact), 2019-2023  
**Session Chair**, Intersections between particle physics and cosmology, June 2022  
**Session Chair**, Dark Matter - Experimental Searches, DPF, Virtual, July 2021  
**Judge for SESAPS Posters**, 2018  
**Convener**, Muon Working Group for NuFact Conference, 2016-2018  
**Session Chair**, Muon working group plenary and parallel session, NuFact 2018, Blacksburg, VA  
**Session Chair**, Muon working group, NuFact 2017, Uppsala, Sweden  
**Host/organizer**, SPS National Zone 4 meeting, Charlottesville, 2017  
**Session Chair**, LLWI, Lake Louise, Canada, 2017  
**Reviewer**, DOE Early Career Award Application Reviewer: 2016, 2017  
**Member** Fermilab Computational Science Strategy Group, 2016  
**Organizing Committee**, 2016 SESAPS Meeting, Charlottesville, VA, November 2016  
– Also session chair for low-energy parallel.  
**Organizing Committee**, PASCOS 2016, Quy Nhon Vietnam, 2016  
– Also organized low-energy parallels and chaired plenary session.  
**Organizing Committee**, Charged Lepton Flavor Violation 2016, Charlottesville, VA, May 2016  
**Session Chair**, Parallel Session, CHEP2015, Okinawa Japan, April 2015  
**Session Chair**, HEP Parallel Session, SESAPS, Columbia SC, Nov 2014  
**Session Chair**, Fermilab Users Meeting, Batavia IL, June 2014  
**Participant** Fermilab UEC trip to D.C., advocate for fundamental science, 2013-2016  
**Organizer**, Fermilab UEC trip to D.C., advocate for fundamental science, 2013 and 2014  
**Contributor**, P5 Virtual Town Hall Meeting, particle physics planning exercise, 2013  
**Organizer**, Fermilab Symposium, UEC non-academic job discussion, 2013  
**Session Chair**, Top Physics Plenary Session, APS, Atlanta GA, April 2012  
**Scribe**, Charged Lepton Session, Intensity Frontier Workshop, Rockville MD, Nov. 2011  
**Session Chair**, Higgs Physics Parallel Session, SESAPS, Roanoke VA, Oct. 2011  
**Session Chair**, Low Energy Searches Parallel Session, DPF, Providence RI, July 2011  
**Poster Session Judge**, Fermilab User's Meeting, 2008,2013

## REFEREE EXPERIENCE

**Editor**, Virginia Academy of Science, Astronomy, Math, and Physics Section, 2018-2021  
**Fermilab Directors Review for HL-LHC US-CMS, Endcap Calorimeter, 2022**  
**Panelist member of 2021 DOE IF Comparative Review Panel**  
**9 proposals -DOE Base Proposal Comparative Review** 2018,2019,2021  
**11 papers - Physical Review Letters** 2011, 2012, 2014, 2016, 2 in 2017, 2 in 2018, 2019,2021, 2 in 2022  
**1 paper- Nuclear Instruments and Methods in Physics** 2018  
**6 papers - Physical Review D.** 2011, 2012, 2013, 2014,2020, 2022  
**5 papers - Phys. Letters B** 2012,2013,2014,2015, 2018  
**1 paper - Physical Review AB** 2019  
**1 paper - Journal of Instrumentation** 2022  
**NuFact Conference Proceedings** 2019,2020  
**8 proposals -DOE ECA Proposal review** 2015,2016

## MEMBERSHIP

**American Physical Society** (lifetime member)  
**APS Division of Particles and Fields** (lifetime member)  
**Virginia Academy of Science** (lifetime member)  
**User Stanford Linear Accelerator Lab** (2019-current)  
**User Fermi National Accelerator Lab** (2000-current)  
**Speaker's board for the Mu2e Experiment** (2016-2017)  
**Publication board for the Mu2e Experiment** (2014-2015)  
**Mu2e committee on authorship policy** (2014)  
**NOvA committee on publication policy** (2012-2013)  
**CDF committee on data preservation** (2012-2013)  
**Tevatron New Phenomenon and Higgs Working Group** (2011 - 2013)  
**National Scholars, Honor Society** (inducted 2007)  
**Phi Kappa Phi, Honor Society** (inducted 2006)  
**Philomathean Literary Society**  
**Kappa Mu Epsilon, Mathematics Honor Society**  
**Sigma Pi Sigma, Physics Honor Society**

## EXPERIMENT AND PROJECT REVIEW EXPERIENCE

**Mu2e IPR -Independent Project Review**, 2018,2019,2021  
**LDMX DMNI Progress Review**, 2021,2022  
**Mu2e Operations Review**, 2020  
**Mu2e CRV Construction Readiness Review**, October 2018  
**Mu2e CRV Module Factory Safety Review**, 2016, 2017,2019, 2021  
**Mu2e DOE CD3 Review**, June 2016  
**Mu2e Fermilab Director's Review, CD3**, April 2016  
**Mu2e Final Design Review**, February 2016  
**Reviewer: Mu2e Offline Computing Review**, February 2014  
**NOvA Computing Portfolio Management Review**, Jan. 2013, April 2014, Jan. 2015  
**NOvA Fermilab Director's Readiness Review**, Nov.2014  
**Mu2e DOE CD2 Review**, October 2014  
**Mu2e Independent Cost Review**, August 2014  
**Mu2e Fermilab Director's Review, CD2**, July 2014  
**Mu2e DOE CD1 Review**, 2012  
**Mu2e DOE CD0 Review**, 2009



## DEPARTMENTAL AND UNIVERSITY SERVICE

Helped organize the UVA contribution to, and tours for, the meeting of the National Society of Black Physicists, 2022  
Long Range Planning Committee, 2011,2021-2022  
Teaching Committee,2019-2022  
Chair, Scholarship/Fellowship Committee,2021-2022  
Undergraduate Program Committee, 2015-2021  
Chair,Outstanding Student Award Committee,2018-2021  
Faculty Advisor to SPS and Sigma Pi Sigma, 2013-2021  
– Recognized by SPS as Distinguished (2013,2014,2015,2018,2021), Outstanding (2016,2017,2019,2020)  
– Hosted zone meeting: 2017, and 2020 (delayed COVID-19)  
Arts and Sciences Dean’s Task Force on Peer Review,2018-2019  
Arts and Sciences Committee on Personnel Policy,2018-2020  
Committee on Infrastructure and Safety,2018-2019  
Physics Building Renovation Committee, 2014,2018-2019  
Astrophysics Search Committee, 2017  
Organized trip for students to PhysCon, 2016,2018  
Ph.D. Committees: Grace Cummings (2022), Matt Feller (Math, 2022), Andrew Sutton (2022), Konstantin Lehmann (External,Simon Frazer University, 2022), Matt Joyce(2021), Steve Boi (2021), Cristiana Principato (2021), Charlie Glaser (2020), Trinh Le(2017), Ji Liu (External, William and Mary, 2016), John Wood and Tim Pennucci (Astronomy,2015), Hao Liu and Rachael Beaton (Astronomy, 2014)  
Research Review Committees: Wang, Goodell, Li, Xiao, Glaser, Boyd, Le, Walker  
Graduate Recruitment Fair Participant, SESAPS 2014, 2018, 2022  
Undergraduate Advising, 2011-2012,2013-2014, 2016-2017, 2018-2019  
Judge for Undergraduate Research Symposium, 2013, 2021  
Long Range Planning Committee, Elected by faculty, 2013  
High Energy Physics Seminar Organizer, 2013-2015  
Graduate Program Committee, 2012-2013  
Graduate Student Poster Session Judge, 2011,2013

## TEACHING EXPERIENCE AT UVA

**DSECOP Workshop, UMD** Summer 2022  
I was invited to participate in the Workshop on Data Science Education in the Physics Curriculum. The primary goal of this workshop is to develop a community around incorporating data science into the undergraduate physics curriculum.

**PHYS 1655** Spring 2022,Fall 2022, Spring 2023  
Introduction to Python for Scientists and Engineers: New Course! Provided science and engineering students with a valuable and broad introduction to computing with Python and basic statistical tools for data analysis. The course climax is a two-week discussion of machine learning, and we even train a Neural Network!

**PHYS 2620** Fall2020,Fall2021  
Modern Physics: Provided 80 students with a rigorous introduction to many topics in Modern Physics.

**PHYS 2660** Spring 2019, Spring 2020, Spring 2021  
Fundamentals of Scientific Computing: Provided 40 students per semester with a valuable introduction to computing and statistics in physical sciences.

**PHYS 1010** Spring 2016 and 2017  
The Physical Universe I: I redesigned this physics course for non-science majors.



**PHYS 1710** Fall 2015, 2016, and 2017  
I redesigned this first-semester physics major course.

**Nucleus Program, UVA** 2015  
Nucleus is a program designed to help faculty improve STEM education at UVA using research-based pedagogies and assessment.

**Course Design Institute, UVA** Summer 2015  
CDI is an intensive, multi-day, hands-on seminar. I applied these learning-focused course design ideas to the redesign of PHYS 1710 and PHYS 1010.

**PHYS 1610** Fall 2013 and 2014  
Lectured and managed this course for approximately 50 first-year Physics majors per year. The course covered the topics of classical mechanics and special relativity.

**PHYS 2020** Spring 2011, 2012, and 2013  
Lectured and managed this course for approximately 200 pre-med students per year. The course covered the topics of electricity and magnetism, geometrical optics, and modern physics.

**PHYS 3993** Spring 2013  
I have had one student do independent study with me who registered for PHYS 3993:  
– Elton Ho (Spring 2013)

**PHYS 3995** 2011 – 2022  
I have had over 20 undergraduate students do research with me and register for the individual supervised research course PHYS3995.

**Teaching Workshop** Summer 2011  
College Park, MD  
Attended three-day new physics and astronomy faculty teaching workshop held by American Association of Physics Teachers.

## TEACHING EXPERIENCE PRIOR TO UVA

**Substitute Lecturer** Summer 2005  
Department of Physics, University of Florida  
Lectured for calculus based Electricity and Magnetism course in large lecture hall at the request of instructor.

**Teaching Assistant** 2003 – 2004  
Department of Physics, University of Florida  
Led discussion sections, held office hours, and graded exams for introductory physics II.

**Teaching Assistant** 1999 – 2000  
Department of Physics, Florida State University  
Taught lab sessions, held office hours, and graded lab reports for introductory Astronomy class.

**Private Tutor** 2000 – 2005  
Department of Physics, University of Florida  
Department of Physics, Florida State University

**Teaching Assistant** 1998 – 1999  
Erskine College  
Assisted students in setup and performance of modern physics lab.

## GENERAL OUTREACH EXPERIENCE

### **REU Lunch With a Scientist: NuFact 2022:**

#### **Judge for Oral and Poster Presentations:**

- April Meeting 2022.
- SESAPS 2018
- $\Sigma\Pi\Sigma$  Research Symposium, 2012, 2016, 2021
- UVA Undergraduate Research Network, 2017
- Fermilab User’s Meeting, 2008, 20012

#### **UVA College Science Scholars:**

Particle physics overview and tour of UVA HEP lab. Fall 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, and 2022.

#### **Organized Public Lectures:**

Using funds from a Page-Barbour grant, I organized two public lectures. In Fall 2016 more than 450 people attended nobel laureate, Adam Riess’s, lecture “The Accelerating Universe” at the Jefferson Theater in downtown Charlottesville. In Spring 2017 about 100 attended well-known scientist, Francis Halzen’s, lecture “Ice Fishing for Neutrinos at the South Pole” in the Dome Room at the Rotunda.

#### **Boy Scouts - nuclear physics merit badge:**

Particle and nuclear physics overview and tour of UVA HEP lab. Fall 2014.

#### **Q&A Session for the documentary film *Particle Fever*:**

Downtown Mall, Regal Cinema in Charlottesville, Spring 2014.

#### **Tours of the CDF Experiment:**

- REU summer students, Aug. 5, 2009
- Fermilab Open House, Feb. 11 2007 and Jan. 17, 2009
- Linear Collider Accelerator School students October 24, 2008
- Hadron Collider Summer School students Aug 16, 2008
- Tour of CDF for local high school students May 21, 2008
- Private tour of Fermilab for small group of college students from Texas, March 19 2007
- Tour for Congressman Kirk and group of 7th graders, Feb. 17, 2007

#### **Blogger for the Mu2e Experiment on Quantum Diaries (2011):**

- I wrote a few short articles about some aspects of the Mu2e experiment.
- <http://www.quantumdiaries.org/author/fermilab/>

**Editor for “Result of the Week” in Fermi Today (2008 - 2010) :** For two years I served as the editor for bi-weekly articles featuring new results from the CDF experiment in the online newsletter “Fermi Today”. I selected the topic and worked closely with the researchers and the editors of Fermi Today to ensure that the article was interesting and understandable to the non-scientists at Fermilab.

## POLITICAL OUTREACH EXPERIENCE

- Tour of UVA HEP lab for Representative Robert Hurt (April 2014)
- DC trip to advocate for support of particle physics (2013, 2014, 2015, and 2016)
- Government Relations Committee, Fermilab Users’ Executive Committee (Organizer for 2013 and 2014 DC trip to advocate for support of particle physics.)
- Lunch with Steve Koonin, DOE Under Secretary for Science (Fermilab Users’ meeting 2010)
- Lunch with Daniel Poneman, DOE Deputy Secretary and William Brinkman, DOE director of the Office of Science

## MENTOR EXPERIENCE

I take pride in my mentorship roles, and I have a history of success at receiving support for and directing undergraduate and high-school students on research projects in experimental particle physics. In 2009 I was recognized with the Outstanding Mentor Award by the US Department of Energy for my work with undergraduate students on the CDF experiment. In addition to the list below, I have served as a mentor to dozens of students and postdoctoral researchers through my leadership roles on the CDF, Mu2e, NO $\nu$ A, and LDMX experiments. 2011-2015 I started and directed a summer research program with support from the UVA Jefferson Trust for undergraduate physics majors at UVA in which two students each summer engage in an intense research experience at Fermilab. I'm always looking for ways to improve my mentoring skills. For example, in 2022 I will serve as an APS Career Mentoring Fellow. As of summer 2022 I have graduated 3 Ph.D. students with another expected by the end of this year.

### Postdoctoral Researchers

**Matt Solt**, University of Virginia, Summer 2020 - . Matt received his Ph.D. from Stanford in summer 2020 and joined our group in the fall of 2020. He has experience in accelerator-based dark matter searches and, as such, is a valuable addition to our LDMX efforts. He is also helping to fabricate the Mu2e cosmic ray veto, lead the QC effort of those modules, and will contribute to the commissioning of Mu2e as we install the experiment.

**Reddy Gandrajula**, University of Virginia, 2020 - 2022 . Reddy had experience on the NO $\nu$ A experiment at Fermilab and helped lead our efforts, and our graduate students, there. He is also contributed to the testing of CRV modules as they arrive at Fermilab.

**Michael Baird**, University of Virginia, 2017 - 2020. Michael had experience on the NO $\nu$ A experiment at Fermilab and helped lead our efforts, and our graduate students, there. He had several leadership rolls on NO $\nu$ A including convening the 3-flavor neutrino oscillation analysis group.

**Yuri Oksuzian**, University of Virginia, Summer 2010 - 2018. Yuri received a well-deserved permanent scientist position at Argonne National Lab. Yuri played a leading role in the R&D efforts for the cosmic ray veto system of the Mu2e experiment where he served as a co-convenor for the Neutron and Gamma Working group and L3 manager for the CRV fiber effort. On the CDF experiment, Yuri optimized the  $b$ -jet tagging strategy of the low-mass Higgs effort. Yuri was selected as a 2011 URA Visiting Scholar and received \$20,000 to support his research efforts at Fermilab. Yuri also joined the NO $\nu$ A experiment where did database work and made major contributions to a new trigger to support our group's effort to use NO $\nu$ A as a neutrino telescope for dark matter searches.

### Current and Recent Graduate Students

**Henry Mills**, Henry started with our group in the summer of 2022.

**Jessica Pascadlo**, Jessica started with our group in the summer of 2021. She is particularly interested in the LDMX experiment.

**Anna Hall**, University of Virginia, Started 2018. Expected Ph.D. by end of 2022. Anna started working with us in summer 2018 and will contribute to the Mu2e and NO $\nu$ A experiments.

**Andrew Sutton**, University of Virginia, **Ph.D. 2022**. Domain Generalization with Machine Learning in the NO $\nu$ A Experiment.

**Cristiana Principato**, University of Virginia, **Ph.D. 2021**. An Indirect Search for Weakly Interacting Massive Particles in the Sun Using Upward-going Muons in NO $\nu$ A.

**Steve Boi** (student of Craig Dukes), University of Virginia, **Ph.D. 2021**. Design and Fabrication of a Large-area, High-efficiency Cosmic Ray Veto Detector for the Mu2e Experiment.

### Current and Recent Undergraduate Students

#### **Design and Fabrication of the Mu2e Cosmic Ray Veto:**

**Over 25 UVA undergraduate students** have worked under my supervision to help design, prototype, and build the CRV for the Mu2e experiment.

### Past Graduate Students

**Serdar Kurbanov**, University of Virginia, **M.S. 2016**. Data Driven Trigger Design and Analysis for the NOvA experiment

**Hao Liu**, University of Virginia, **Ph.D. 2014**. Measurement of the  $s$ -channel Single Top Quark Cross Section at the CDF Experiment and Contributions to the Evidence of  $H \rightarrow bb$ .

**Karen Bland**, Baylor University, Ph.D. Summer 2012

Karen focused on optimizing a standard model Higgs boson search by improving photon identification efficiency and background rejection.

**Barbara Alvarez**, Universidad de Oviedo, Spain; Ph.D. completed 2010

Search for a Higgs boson produced in association with a W boson. Barbara focused her efforts on improving the jet energy resolution information which is used in the matrix element analysis.

**Bruno Casal**, Universidad de Cantabria, Spain; Ph.D. completed 2009

Observation of Single Top Quark production. Bruno focused his efforts on improving muon signal acceptance and optimizing search techniques using boosted decision trees.

### Past Undergraduate and High School Students

#### **Research Adventure in Particle Physics at Fermilab for UVA Undergraduates:**

Over 4 years (2012-2015), I sent 8 students to Fermilab to work on searches for dark matter with the NOvA experiment, analyze test beam data from a Mu2e CRV prototype, and make a QCD measurements with the CDF experiment.

#### **Directed Research of UVA Physics Major (2011 - 2013):**

- **Kaitlin Johnson** (May 2012 - Dec. 2012): Simulated shielding of fast neutrons.
- **David Abbott** (May 2011 - Aug. 2012): Studied sensitivity of plastic scintillator to neutrons.
- **Jeff Lansford** (2011): Analyzed data from cosmic ray veto prototype for the Mu2e experiment.
- **Eric Nguyen** (2011): Considered design issues for the cosmic ray veto for the Mu2e experiment.

**High School Students on Mu2e (Summer 2009 and 2010):** Led local high school students on R&D for the cosmic ray test stand of the Mu2e experiment.

**IMSA Student at CDF (2007 - 2009):** Supervised an Illinois Math and Science Academy high school student on an analysis of CDF data which searched for the Higgs boson decaying to two photons. The student was extremely successful, and we wrote two PRLs based on his efforts.

**Italian Summer Student (2008):** Wrote a proposal for and supervised a participant of the INFN-DOE Summer Students program.

**SULI Summer Student at CDF (2008):** Wrote a proposal for and supervised a participant of the DOE's Science Undergraduate Laboratory Internships program.

**Pre-Service Teaching Internship at CDF (2007):** Wrote a proposal for and supervised a participant of the DOE's Pre-Service Teaching internship

**REU Summer Student (2003):** NSF REU program at the University of Florida.

## RECENT CONFERENCE TALKS AND SEMINARS

### ***“LDMX: The Light Dark Matter eXperiment”***

- Invited, South Eastern section of APS (SESAPS), Oxford MS, Nov 2022
- Interconnections between Particle Physics and Cosmology (INPP), Washington University in St. Louis, June 2022
- Virginia Academy of Science, May 2022
- Duke Joint HEP/Theory Seminar, Zoom, COVID-19, May 2021
- APS April Meeting, Virtual, COVID-19, April 2020
- Brandeis Dark Universe Seminar, Boston, MA, Oct. 2019
- Virginia Tech Neutrino Seminar, Blacksburg, VA, Dec. 2019

### ***“Career Paths of Physics Degree Holders”***

Mentoring Workshop, South Eastern section of APS (SESAPS), Oxford MS, Nov 2022

### ***“What is Hiding Beyond the Standard Model”***

Colloquium, University of Virginia, Sept. 2022

### ***“The Mu2e Experiment at Fermilab”***

- Plenary, Interplay Between Particle and Astroparticle Physics, Vienna, Cancelled - COVID, [Austria](#), Sept. 2022
- Invited, 23rd International Workshop on Neutrinos from Accelerators, Salt Lake City, Utah, August 2022
- Invited, Conference on Intersections of Particle and Nuclear Physics, Vail, CO, May 2015

***“Expanding the search for dark matter with accelerator-based experiments”*** (Invited Colloquium)

- University of Florida, Gainesville, FL, Jan 2022
- College of William and Mary, Williamsburg, VA, April 2022

### ***“A Renaissance for Muon Physics”*** (Invited Colloquia)

- Florida State University, Tallahassee, FL, Jan 2022
- Michigan State University, virtual, Nov 2021
- Lund University, [Sweeden](#), virtual, June 2021
- University of South Carolina Colloquium, Columbia, SC, Sept. 2019
- Baylor Colloquium, Waco, TX, Oct. 2018
- Texas A&M Colloquium, College Station, TX, Oct. 2018

### ***“Asking the Universe Fundamental Questions”***

- Invited Public Lecture, UMW, September 2021
- Society of Physics Students, UVA, Feb. 2022

### ***“Fabrication of a high-efficiency cosmic ray veto detector for the Mu2e experiment”***

- Poster: 23rd International Workshop on Neutrinos from Accelerators, Salt Lake City, Utah, August 2022
- Meeting of the APS Division of Particles and Fields, Virtual, July 2021
- Meeting of the Virginia Academy of Science, Richmond, VA, May. 2017

### ***“Fabricating scintillator-based veto detectors for particle physics experiments at UVA”***

Meeting of the Virginia Academy of Science, Virtual, COVID, May. 2021

***“Recent Results from the NOvA Experiment”***

- Invited, South Eastern section of APS (SESAPS), Knoxville TN, Nov 2018
- Invited Seminar, U. Tennessee, Knoxville TN, Nov. 2018 – Lake Louise Winter Institute, [Canada](#), Feb. 2017
- XXX Rencontres de Physique de la Vallee d’Aoste, La Thuile, [Italy](#), March 2016

***“A Proposed Sensitivity Upgrade for the Mu2e Experiment”***

Invited/Parallel, NuFact Workshop, Blacksburg, Aug. 2018

***Introduction and Summary talks for the Muon Physics Working Group***

Invited/Plenary, NuFact Workshop, Blacksburg, Aug. 2018

***“Searching for Charged Lepton Flavor Violation at Fermilab”***

Experimental Particle Physics Seminar, Zurich, [Switzerland](#), October 2017

## PAST CONFERENCE TALKS AND SEMINARS

***“Hoos at Fermilab”***

Colloquium, University of Virginia, Sept. 2015

***“The Mu2e Experiment at Fermilab”***

Invited, Conference on Intersections of Particle and Nuclear Physics, Vail, CO, May 2015

***“Computing at the Intensity Frontier”***

Plenary, Conference on Computing in High Energy Physics (CHEP), Okinawa, [Japan](#), April 2015

***“Status of the NO $\nu$ A Experiment”***

Invited, South Eastern section of APS (SESAPS), Columbia, SC, Oct. 2014

***“Studies of Single Top Production at the Tevatron”***

XXVIII Rencontres de Physique de la Vallée d’Aoste, La Thuile, [Italy](#), Feb. 2014

***“Design considerations for the cosmic-ray-veto system of the Mu2e experiment”***

Meeting of the APS Division of Particles and Fields, UC Santa Cruz, Aug. 2013

***“Higgs Boson Searches at the Tevatron”***

- Lake Louise Winter Institute, [Canada](#), Feb. 2013
- Colloquium, College of William and Mary, Jan. 2013
- Colloquium, University of Virginia, Sep. 2012
- Invited, APS April Meeting, Atlanta, GA, April 2012

***“Recent Results from the Tevatron”***

Invited, Workshop on The LHC, Particle Physics, and the Cosmos, Auckland, [New Zealand](#), July 2012

***“Tevatron Higgs Searches: Past and Future”***

Invited, The Next Stretch of the Higgs Magnificent Mile, Chicago, IL, May 2012

***“Charged Lepton Flavor Violation Discussion Summary Report”***

Intensity Frontier Workshop, Rockville, MD, Nov. 2011

***“The Impact of Higgs Searches at the Tevatron in the LHC Era”***

- Invited, South Eastern Section of APS (SESAPS), Roanoke, VA, Oct. 2011
- Physics Seminar, James Madison University, Oct. 2011

***“Status and Summary of the Mu2e Experiment”***

- Meeting of the APS Division of Particles and Fields, Brown University, Aug. 2011
- Invited, Fermi National Accelerator Laboratory, Users’ Meeting, June 2011

***“Low-mass Higgs Searches at the Tevatron”***

Workshop on Higgs Cross Sections for the LHC, Brookhaven National Laboratory, NY, May 2011

***“Searches for New Physics at the Tevatron”***

Plenary, DIS2011, Newport News, VA, April 2011

***“Recent Studies of the Underlying Event from CDF”***

Northwestern University HEP Seminar, Evanston, IL, May 2010

***“The Race for the Higgs Boson”***

- University of Virginia physics colloquium, March 2012
- University of Alabama physics colloquium, March 2010
- FIU Physics Colloquium, Miami, FL, April 2009

***“A Foundation for Low-Mass Higgs Searches”***

Lawrence Berkeley National Laboratory, CA, Jan. 2010



***“R&D Plans for the Cosmic Ray Veto System”***

Mu2e Collaboration Meeting, Rice University, Jan. 2010

***“Status of Low-Mass Higgs Searches at the Tevatron”***

SLAC Experimental Seminar, Menlo Park, CA, November 2009

***“Lighting up the Higgs sector with photons at CDF”***

- Notre Dame HEP Seminar, Notre Dame, IN, November 2009
- University of Wisconsin HEP Seminar, Madison, WI, April 2009

***“Low Mass Higgs Boson Search Improvements at CDF”***

Tevatron Higgs Workshop, Fermilab, May 2009

***“The Observation of Single Top Production at the Tevatron”*** (April 2009)

- University of Victoria HEP Seminar, Victoria, [Canada](#)
- TRIUMF National Lab Seminar, Vancouver, [Canada](#)

***“Searching for the Higgs One Single Top at a Time”***(Jan. – Feb. 2009)

- FSU HEP Seminar, Tallahassee, FL
- MSU HEP Seminar, East Lansing, MI
- Michigan HEP Seminar, Ann Arbor, MI

***“Status of Higgs Searches at CDF”***

- Instituto de Fisica de Cantabria HEP Seminar, Santander, [Spain](#), March 2008
- University of Florida HEP Seminar, Gainesville, FL, Feb. 2008
- Lake Louise Winter Institute, Alberta, [Canada](#), February 2009

***“Recent QCD Results from the Tevatron”*** (Jan. - Feb. 2008)

- XXII Rencontres de Physique de la Vallee d’Aoste, La Thuile, [Italy](#)
- Argonne HEP Seminar, Argonne National Lab

***“The Inclusive Jet Cross Section at CDF”*** (Feb. - Sept. 2006)

- FSU HEP Seminar, Tallahassee, FL
- Seminar at the Enrico Fermi Institute, Chicago, IL
- Vanderbilt Nuclear and Particle Physics Seminar, Nashville, TN
- Pheno Symposium, Madison, WI
- University of Florida HEP Seminar, Gainesville, FL
- APS April Meeting, Dallas, TX
- CDF Collaboration meeting, FNAL, IL
- UF-FSU Phenomenology Symposium, Tallahassee, FL, December 2004

## MENTEE TALKS AND SEMINARS

### **Matt Solt, postdoctoral researcher:**

*“LDMX: The Light Dark Matter eXperiment”*

– Invited, NuFact: Workshop on Neutrinos from Accelerators, Salt Lake City, Utah, 2022

– Invited, MEPA Workshop, (virtual) [China](#), Dec. 2022

*‘Dark Matter at Accelerators: the HPS and the LDMX experiments’*

– Invited, 14th Intersections of Particle and Nuclear Physics, Florida, Sept. 2022

– Invited, Meeting of the Southeastern Section of APS, Tallahassee FL, Nov. 2021

*“Design and Fabrication of the Cosmic Ray Veto for Mu2e*

Fermilab New Perspectives Meeting, June 2022

*“Searching for Long-Lived Dark Photons with the Heavy Photon Search Experiment”*

APS/DPF Meeting, Virtual COVID-19, July 2021

### **Reddy Gandrajula, postdoctoral researcher:**

*“Detector performance and Data Quality monitoring at the NOvA Experiment”*

APS/DPF Meeting, Virtual COVID-19, July 2021

### **Michael Baird, postdoctoral researcher:**

*“Latest Oscillation Results from the NOvA Experiment”*

– ICHEP 2020 Conference on High Energy Physics, Prague, Czech Republic (virtual), July 2020,

– J-PARC 10th Anniversary Symposium, Tsukuba, Japan, Sept. 2019

– HEP Seminar, University of Maryland, College Park, MD, May 2019

– Aspen Center for Physics, Aspen, CO, March 2018

*“Summary of the Second  $\nu_\mu$  Disappearance Results from the NOvA Experiment”*

– APS-DPF Meeting, Fermilab, Batavia, IL, July 2017

– HEP Seminar at the University of Virginia, May 2017, Charlottesville, VA

**Yuri Oksuzian, postdoctoral researcher:**

***“Looking for answer with muons at  $g-2$  and Mu2e Veto”***

Argonne Division Seminar, Argonne National Lab, IL, May. 2018

***“Wavelength-Shifting Fiber Performance for the Mu2e Cosmic Ray Veto”***

– 2nd Int. Conf. on Charged Lepton Flavor Violation, Charlottesville, VA, June 2016

– APS Meeting of Division of Particles and Fields, Detroit, MI, 2015

***“Studies of Beam-Induced Radiation Backgrounds for the Mu2e CRV”***

– APS/DPF, Fermilab, August 2017

– International Conference on High Energy Physics (ICHEP), Chicago, IL, August 2016

– 2nd International Conference on Charged Lepton Flavor Violation, Charlottesville, VA, 2016

– APS Meeting of Division of Particles and Fields, Detroit, MI, August 2015

***“A Cosmic Ray Veto Detector for the Mu2e Experiment at Fermilab”***

– APS Meeting of Division of Particles and Fields, Detroit, MI, August 2015

– Technology and Instrumentation in Particle Physics, Chicago, IL June 2011

– New Perspectives, Batavia, IL June 2011

***“The Mu2e Experiment”***

– Argonne Division Seminar, ANL, IL Aug 2017

– APS/DPF, Fermilab, Aug. 2017

– International Workshop on Baryon and Lepton Number Violation, Cleveland, May 2017

– International Symposium on Symmetries in Subatomic Physics, Victoria, [Canada](#), June 2015

– Fermilab Users Meeting, Batavia, IL June 2014

***“Latest Results from the Tevatron”***

16th Lomonosov Conference on Particle Physics, Moscow, [Russia](#), Aug. 2013

***“Searches for New Physics in Top Events at the Tevatron”***

Moriond QCD, La Thuile, [Italy](#), March 2013

***“Higgs Boson Searches at the Tevatron”***

– Annual Postdoctoral Research Symposium, Argonne, Sept. 2012

– BNL Physics Seminar, Upton, NY, Aug. 2012

– Invited, CIPANP 2012, St. Petersburg, FL, May 2012

– APS April Meeting, Atlanta, GA March 2012

**Jessica Pascadlo, graduate student:**

- *“Visible signatures of the Dark Sector at LDMX”*
- Fermilab New Perspectives Meeting, June 2022

**Anna Hall, graduate student:**

- *“Data-Driven Checks for  $e$  Selection Efficiency at NOvA”*
- UVA High Energy Physics Seminar, April 2022
- UVA Society of Physics Students, April 2022
- APS/DPF Meeting, Virtual COVID-19, July 2021
- APS April Meeting, Virtual COVID-19, April 2021
- APS April Meeting, Virtual COVID-19, April 2020
- Neutrino, Virtual COVID-19, June 2020

**Andrew Sutton, graduate student:**

- *“Latest Long-baseline Oscillation Results from NOvA ”*
- Oral Presentation, APS April 2021 Meeting, Virtual COVID-19

*“NOvA Event Reconstruction Techniques”*

- Poster, APS April Meeting, Columbus, OH, April 2018
- Poster, 53rd Annual Fermilab Users Meeting, August 2020

*“The NOvA Test-Beam Program”*

- Oral Presentation, CALOR2020, Cancelled COVID-19, Sussex
- Oral Presentation, DPF 2019, Boston MA
- Poster, NuFact Workshop, Blacksburg, Aug. 2018

**Cristiana Principato, graduate student:**

- *“Searching for Dark Matter Using the NOvA Upward-going Muon Trigger”*
- International Conference on High Energy Physics (ICHEP), Chicago, IL, August 2016
- APS/DPF Meeting, Fermilab, IL, 2017

**Hao Liu, graduate student:**

*“Top Quark Production at the Tevatron”*

- Conference on Large Hadron Collider Physics, New York City, NY, June 2014

*“Measurement of  $s$ -channel single-top-quark production in lepton+jets at CDF”*

- APS Meeting of Division of Particles and Fields, Santa Cruz, CA Aug. 2013

*“Improving the Trigger Efficiency for the WH-lvbb analysis at CDF”*

- APS April Meeting, Atlanta, GA March 2012
- South Eastern section of APS (SESAPS), Roanoke, VA, Oct. 2011

## Undergraduate students:

**Lincoln Curtis** “**The Light Dark Matter Experiment: The search for visible decays**”, SESAPS, Oxford MS, Nov. 22

**Sydney Roberts** “**The Search for Hidden Structures in the Temple of Kukulcn Using Cosmic-Ray Muons**”, Virginia Academy of Science, May 2022

**Sydney Roberts** “**Performance of WLS Fibers for the Mu2e CRV**”  
APS - Division of Particles and Fields (DPF) Meeting, virtual-COVID, July 2021

**“Fabrication of a Cosmic Ray Veto System for the Mu2e Experiment”**

- Poster, William Musk, APS 2020, Virtual COVID-19
- Poster with proceedings, Hannah Woodward, DPF 2019, Boston MA.
- Poster, Kyle Fielman, Virginia Academy of Science 2019
- Poster, William Musk, PhysCon 2019, Providence RI.
- Poster, Danny Mills and Ben Barton, NuFact Workshop, Blacksburg, Aug. 2018

**Ben Barton** “**Simulation of the Cosmic Ray Background for the Mu2e Experiment**”  
APS 2020, Virtual COVID-19

**Ben Barton and Danny Mills** “**The CRV Detector for the Mu2e Experiment**”

- Poster, NuFact Workshop, Blacksburg, Aug. 2018
- South Eastern section of APS (SESAPS), Knoxville TN, Nov 2018

**Ningshun Chen** “**Performance of Scintillation Counters as Measured at the Fermilab Test Beam Facility for the Mu2e Cosmic Ray Veto System**”

- Poster, NuFact Workshop, Blacksburg, Aug. 2018
- Poster, South Eastern section of APS (SESAPS), Knoxville TN, Nov 2018

**Peter Farris** “**Performance of Wavelength-Shifting Fibers for the Mu2e CRV**”

Poster, NuFact Workshop, Blacksburg, Aug. 2018

**Peter Farris** “**Aging Properties of the Mu2e Cosmic Ray Veto System**”

- Poster, NuFact Workshop, Blacksburg, Aug. 2018
- South Eastern section of APS (SESAPS), Knoxville TN, Nov 2018

**Peter Farris and Pedrom Zadeh** “**Studies to Understand and Optimize the Performance of Scintillation Counters for the Mu2e Cosmic Ray Veto**”

- Poster: DPF, Fermilab, IL, Aug. 2017
- Poster: Undergraduate Research Symposium, **1st place**, UVA, Nov. 2017

**“Techniques for the Dark Matter Search at the NOvA Experiment”**

- Rob Mina, DPF Meeting, Ann Arbor, MI, August 2015
- Rob Mina, Poster, Computing in High Energy Physics, Okinawa, [Japan](#), April 2015
- Rob Mina, Poster, Fermilab Users Meeting, Batavia, IL, June. 2015
- Rob Mina, SESAPS, Columbia, SC, Nov. 2014
- Eric Fries, SESAPS, Columbia, SC, Nov. 2014
- Litig Xiao, SESAPS, Boiling Green, KY, Nov. 2013
- Ranjani Sarma, SESAPS, Boiling Green, KY, Nov. 2013

**Tyler Lam** “**Accelerated Aging Studies for the Mu2e Cosmic Ray Veto System**”

Poster, South Eastern section of APS (SESAPS), Charlottesville, VA, Nov. 2016

**Yongyi Wu:** “**Test beam studies of the Mu2e Cosmic-Ray-Veto Prototypes**”

- Poster, Fermilab Users Meeting, Batavia, IL, June. 2015
- SESAPS, Columbia, SC, Nov. 2014

**Alyssa Henderson:** *“Studies of Silicon Photomultipliers for the Mu2e Experiment”*  
South Eastern section of APS (SESAPS), Tallahassee, FL, Nov. 2012

**David Wilson:** *“Minimum-bias studies at the Tevatron”*  
South Eastern section of APS (SESAPS), Tallahassee, FL, Nov. 2012

**David Abbott:** *“Sensitivity of Plastic Scintillator to Fast Neutrons”*  
– South Eastern section of APS (SESAPS), Roanoke, VA, Oct. 2011  
– UVA Presidential Poster Competition, 2011

# Robert Craig Group

## PUBLICATION LIST <sup>1</sup>

### Recent Publications in Refereed Journals

- [1] “*Expected Sensitivity of the LDMX Experiment to Visible Signatures of Dark Matter*”, In preperation (expected 2023)
- [2] “*Fabrication of the Mu2e Cosmic Ray Veto Detector*”, In preperation (expected 2023)
- [3] “*Performance of the Wavelength-Shifting Fiber Upgrade for the Mu2e Cosmic-Ray Veto Detector*”, Under collaboration review (2022)
- [4] “*Mu2e Run I Sensitivity Projections for the Neutrinoless  $\mu \rightarrow e$  Conversion Search in Aluminum*”, Universe 2023, 9(1), 54
- [5] “*An Improved Measurement of Neutrino Oscillation Parameters by the NOvA Experiment*”, Phys. Rev. D 106 032004. (2022)
- [6] “*Search for Multi-Messenger Signals in NOvA Coincident with LIGO/Virgo Detections*”, Phys. Rev. D 101, 112006 (2020)
- [7] “*A High Efficiency Photon Veto for the Light Dark Matter eXperiment*”, Journal of High Energy Physics volume 2020, Article number: 3 (2020)
- [8] “*First Measurement of Neutrino Oscillation Parameters using Neutrinos and Antineutrinos by NOvA*”, Phys. Rev. Lett. 123, 151803 (2019)
- [9] “*Performance of Wavelength-Shifting Fibers for the Mu2e Cosmic Ray Veto Detector*”, Journal of Instrumentation, Vol. 13 (2018)
- [10] “*New constraints on oscillation parameters from  $\nu_e$  appearance and  $\nu_\mu$  disappearance in the NOvA experiment*”, Phys. Rev. D 98, 032012 (2018)
- [11] “*Photoelectron Yields of Scintillation Counters with Embedded Wavelength-Shifting Fibers With Silicon Photomultipliers*”, Nucl. Instrum. Meth. A890, 84-95 (2018)
- [12] “*Constraints on oscillation parameters from  $\nu_e$  appearance and  $\nu_\mu$  disappearance in NOvA*”, Phys. Rev. Lett. 118, 231801 (2017)
- [13] “*Measurement of the neutrino mixing angle  $\theta_{23}$  in NOvA*”, Phys. Rev. Lett. 118, 151802 (2017)
- [14] “*First measurement of electron neutrino appearance in NOvA*”, Phys. Rev. Lett. 116, 151806 (2016)
- [15] “*First measurement of muon-neutrino disappearance in NOvA*”, Phys. Rev. D. 93, 051104 (2016)

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<sup>1</sup> In addition to publications listed, I was a member of the CDF author list since 2006-2013 with more than 400 publications and almost 30,000 citations (based on the SPIRES - High-Energy Physics Literature Database). I have also made contributions to hundreds of internal experimental notes for the CDF, Mu2e, NOvA, and LDMX experiments.



## Past Publications in Refereed Journals

- [1] “*A Study of the Energy Dependence of the Underlying Event in Proton-Antiproton Collisions*”, Phys. Rev. D. 92, 092009 (2015)
- [2] “*Tevatron Constraints on Models of the Higgs Boson with Exotic Spin and Parity Using Decays to Bottom-Antibottom Quark Pairs*”, Phys. Rev. Lett. 114, 151802 (2015)
- [3] “*Constraints on models of the Higgs boson with exotic spin and parity using the full CDF data set*”, Phys. Rev. Lett. 114, 141802 (2015)
- [4] “*Observation of  $s$ -channel production of single top quarks at the Tevatron*”, Phys. Rev. Lett. 112, 231803 (2014)
- [5] “*Evidence for  $s$ -channel Single-Top-Quark Production in Events with one Charged Lepton and two Jets at CDF*”, Phys. Rev. Lett. 112, 231804 (2014)
- [6] “*First Search for Exotic  $Z$  Boson Decays into Photons and Neutral Pions in Hadron Collisions*”, Phys. Rev. Lett. 112, 111803 (2014)
- [7] “*Higgs Boson Studies at the Tevatron*”, Phys. Rev. D. 88, 052014 (2013)
- [8] “*Combination of Searches for the Higgs Boson Using the Full CDF Data Set*”, Phys. Rev. D. 88, 052013 (2013)
- [9] “*Search for Resonant Top-antitop Production in the Semi-leptonic Decay Mode Using the Full CDF Data Set*”, Phys. Rev. Lett. 110, 121802 (2013)
- [10] “*Evidence for a particle produced in association with weak bosons and decaying to a bottom-antibottom quark pair in Higgs boson searches at the Tevatron*”, Phys. Rev. Lett. 109, 071804 (2012)
- [11] “*Search for a Higgs boson in the diphoton final state using the full CDF data set*”, Physics Letters B 717 (2012) 173181
- [12] “*Combined search for the standard model Higgs boson decaying to a  $bb$  pair using the full CDF data set*”, Phys. Rev. Lett. 109, 111802 (2012)
- [13] “*Search for the standard model Higgs boson decaying to a  $bb$  pair in events with one charged lepton and large missing transverse energy using the full CDF data set*”, Phys. Rev. Lett. 109, 111804 (2012)
- [14] “*Search for the standard model Higgs boson produced in association with a  $W^\pm$  boson with  $7.5 \text{ fb}^{-1}$* ”, Phys. Rev. D. 86, 032011 (2012)
- [15] “*Search for a Higgs Boson in the Diphoton Final State in  $p\bar{p}$  at  $\sqrt{s} = 1.96 \text{ TeV}$* ”, Phys. Rev. Lett. 108, 011801 (2012)
- [16] “*Search for a Higgs Boson produced in Association with a  $W$  Boson Using a Method Based on Matrix Element Techniques*”, Phys. Rev. D. 85, 072001 (2012)

- [17] “*Observation of Single Top Quark Production and Measurement of  $V_{tb}$  with CDF*”, Phys. Rev. D. 82, 112005 (2010)
- [18] “*Measurement of the  $WW+WZ$  Production Cross Section Using a Matrix Element Technique in Lepton + Jets Events*”, Phys. Rev. D. 82, 112001 (2010)
- [19] “*Studying the Underlying Event in Drell-Yan and High Transverse Momentum Jet Production at the Tevatron*”, Phys. Rev. D. 82, 034001 (2010)
- [20] “*Measurement of the  $WW$  and  $WZ$  production cross section in  $\ell\nu jj$* ”, Phys. Rev. Lett. 104, 101801 (2010)
- [21] “*Search for Standard Model Higgs Bosons in  $WH \rightarrow \ell\nu b\bar{b}$* ”, Phys. Rev. Lett. 103, 101802 (2009)
- [22] “*Observation of Single Top Quark Production*”, Phys. Rev. Lett. 103, 092002 (2009)
- [23] “*Search for a Fermiophobic Higgs Boson Decaying into Diphotons at CDF*”, Phys. Rev. Lett. 103, 061803 (2009)
- [24] “*Measurement of Single Top Quark Production at CDF*”, Phys. Rev. Lett. 101, 250601 (2008)
- [25] “*The Inclusive Jet Cross Section Using the Midpoint Algorithm in RunII at CDF*”, Phys. Rev. D78, 052006 (2008)

## Recent Conference Proceedings and Non-refereed Publications

- [1] K. Byrum *et al.* [Mu2e-II], Snowmass Contribution, “*Mu2e-II: Muon to electron conversion with PIP-II*,” [arXiv:2203.07569].
- [2] M. Aoki *et al.*, Snowmass Contribution, “*A New Charged Lepton Flavor Violation Program at Fermilab*,” [arXiv:2203.08278].
- [3] T. Åkesson, *et al.*, Snowmass contribution, “*Current Status and Future Prospects for the Light Dark Matter eXperiment*,” [arXiv:2203.08192].
- [4] “*A Proposed Evolution of the Mu2e Experiment*”, Published, PoS NuFACT2018 (2019) 129.
- [5] “*Studies of the Aging Properties of the Mu2e Cosmic Ray Veto System*”, Published, PoS NuFACT2018 (2019) 040.
- [6] “*A High-efficiency Cosmic Ray Veto Detector for the Mu2e Experiment*”, Published, PoS NuFACT2018 (2018) 034.
- [7] “*Dark Sector Physics with a Primary Electron Beam Facility at CERN*”, CERN-SPSC-2018-023.
- [8] “*Expression of Interest for Evolution of the Mu2e Experiment*”, arXiv:1802.02599.
- [9] “*Studies to Understand and Optimize the Performance of Scintillation Counters for the Mu2e Cosmic Ray Veto System*”, C17-07-31, arXiv:1709.09831.
- [10] “*Progress in the Search for Dark Matter Using Upward-going Muons in NOvA*”, PoS ICHEP, **2016**, 201 (2016).

## Past Conference Proceedings and Non-refereed Publications

- [1] “*Performance of Wavelength-Shifting Fibers for the Mu2e Cosmic Ray Veto Detector*”, DPF 2015, arXiv:1511.06225
- [2] “*Performance of Scintillator Counters with Silicon Photomultiplier Readout*”, DPF 2015, arXiv:1511.00374
- [3] “*A first look at data from the NOvA upward-going muon trigger*”, DPF 2015, arXiv:1511.00155
- [4] “*Fermilab Computing at the Intensity Frontier*”, Conference on Computing in High Energy Physics (CHEP2015), J. Phys. Conf. Ser. 664 (2015) 3, 032012
- [5] “*Implementation of an Upward-going Muon Trigger for Indirect Dark Matter Searches at the NOvA Far Detector*”, Conference on Computing in High Energy Physics (CHEP2015), J. Phys. Conf. Ser. 664 (2015) 082034
- [6] “*Recent Evolution of the Offline Computing Model of the NOvA Experiment*”, Conference on Computing in High Energy Physics (CHEP2015), J. Phys. Conf. Ser. 664 (2015) 3, 032011
- [7] “*Mu2e Technical Design Report*”, The Mu2e Project and the Mu2e Collaboration, arXiv:1211.7019 (2014)
- [8] “*Observation of the s-channel and other studies of single top quarks at the Tevatron*”, XXVIII Rencontres de Physique de la Vallée d’Aoste, Italy, arXiv:1405.0071 (2014)
- [9] “*Software Trigger Algorithms to Search for Magnetic Monopoles with the NOvA Far Detector*”, Conference on Computing in High Energy Physics, Journal of Physics, Vol. 513, 2014
- [10] “*Charged Leptons*”, Summary Report of Snowmass Community Summer Study 2013, arXiv:1311.5278 (2013)
- [11] “*Design considerations for the cosmic-ray-veto system of the Mu2e experiment*”, Proceedings, APS Division of Particles and Fields, Santa Cruz, CA, arXiv:1310.1377 (2013)
- [12] “*Feasibility Study for a Next-Generation Mu2e Experiment*”, Contribution to the Snowmass Community Summer Study 2013, arXiv:1307.1168 (2013)
- [13] “*The Mu2e Conceptual Design Report*”, The Mu2e Project and the Mu2e Collaboration, arXiv:1211.7019 (2012)
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