

## Andrew John Norman

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Fermi National Accelerator Laboratory  
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<b>EDUCATION</b>	Ph.D. in Physics	College of William and Mary	2004
	Dissertation Title: <i>Measurement of the Branching Fraction for <math>K_L^0 \rightarrow \mu^+ \mu^- e^+ e^-</math></i>		
	M.S. in Physics	College of William and Mary	1998
<b>EDUCATION</b>	B.S. in Physics and Mathematics	College of William and Mary	1995
	Honors Thesis Title: <i>A Measurement of the Mass of the Muon Type Neutrino</i>		
<b>RESEARCH POSITIONS</b>	Associate Scientist	Fermi National Accelerator Lab	2010-Present
	Research Scientist	University of Virginia	2008-2010
	Post Doctoral Research Associate	University of Virginia	2004-2007
	Graduate Research Assistant	College of William and Mary	1997-2003
<b>LEADERSHIP ACTIVITIES</b>	<b>FNAL Scientific Computing Division</b>		
	Group Leader	Scientific Data Management and Database Applications	2014-Present
	Leadership and line management (11 direct reports) of personnel developing and maintaining tools for large scale data management and database applications for scientific data processing. Management of the Sequential Access with Metadata (SAM) system for data management, Intensity Frontier Beams Database (IFBeam) system, Electronic Collaboration Logbook (ECL) and other data analysis, data management and database tools for Fermilab experiments provided by the Scientific Computing Division.		
	Group Leader (Interim)	Offline Prod. Operations Group	2014
	Leadership and line management (3 direct reports) of personnel providing operational support for running intensity frontier experiment's (NO $\nu$ A, Minerva, Minos, Mu2e) large scale data processing, analysis and simulation work.		
	Group Leader	Scientific Data Management	2013-2014
	Leadership and line management (6 direct reports) of personnel developing and maintaining tools for large scale data management. Integration and adaptation of the SAM system with/to the NO $\nu$ A experiment's tools and frameworks for simulation and data analysis. Integration with SAM with other intensity frontier experiments at Fermilab. Adaptation and integration of data management tools with the Open Science Grid infrastructure.		
	<b>NO<math>\nu</math>A Collaboration</b>		
	NO $\nu$ A Data Approval and Publications Committee		2013-Present
	NO $\nu$ A Executive Committee		2013-Present
	Computing Division Liaison		2012-Present
	Trigger Systems Convener		2011-Present

## **NO $\nu$ A Project Management**

Deputy Level 2 Project manager	DAQ hardware & electronics	2012-2014
Level 3 Project manager	DAQ Integration	2008-2014
Level 3 Project manager	Detector Controls & Monitoring	2007-2010

## **RESEARCH & TECHNICAL ACTIVITIES**

### **NO $\nu$ A Experiment** 2007-Present

Work on the NO $\nu$ A experiment with extensive work in the development of the data acquisition (DAQ), trigger systems, timing systems and online/offline software and integration. Leadership roles in the NO $\nu$ A collaboration, including as convener of the data driven triggering working group and extensive leadership rolls and work on the designs, implementation, deployment and commissioning of the NO $\nu$ A detector readout systems for the near detector on the surface (NDOS) prototype. Major leadership roles, technical contributions, and research activities on NO $\nu$ A include:

#### **NO $\nu$ A Data Driven Trigger** 2011-Present

Scientific and technical leadership and major research work for the inception, design, development, testing, deployment, commissioning and operations of the “Data Driven Trigger” (DDT) system and infrastructure and for the integration of the DDT system with the primary DAQ readout systems. Leadership and development of the DDT based physics triggers, calibration triggers, and their integration with the NO $\nu$ A physics programs.

#### **Timing & Synchronization System** 2009-Present

Scientific and technical leadership for the design, testing, deployment, integration, commissioning and operations of the timing distribution systems for the NO $\nu$ A far, near and prototype (NDOS) detectors. Scientific and technical leadership for the development, testing, integration, commissioning and operations of the embedded software readout systems for the timing system and of the user interfaces and diagnostic tools for the timing system.

#### **NO $\nu$ A Data Acquisition Readout Systems** 2009-Present

Scientific and technical leadership, development, deployment, commissioning and operations of the NO $\nu$ A DAQ readout systems and subsystem for the far, near and prototype NDOS detectors. Major contributions to the embedded readout systems software/hardware interfaces (front end boards, data concentrator modules, timing distribution units), DAQ computing model and computing clusters for readout and triggering, design of the DAQ data formats, data parsing and unpacking libraries, and integration with the offline analysis framework, development and integration of the data handling systems for NO $\nu$ A and their integration with the SAM infrastructure, development and integration of the accelerator beam information and spill servers, development and integration of the global and DDT triggering systems.

### **Mu2e Experiment** 2007-2011

Development of models and simulations for principle backgrounds (muon decay in orbit, radiative muon capture, cosmic ray shower fluxes), recalculation of experimental backgrounds, estimates for rare processes, general experiment R&D and software infrastructure planning.

**Intensity Frontier Common Computing** 2010-Present  
 Work on development of common computing tools for the Intensity Frontier (IF) experiments (NOvA, Minerva, Mu2e, g-2,  $\mu$ BooNE, LBNE) including rolls in:  
 Leadership, design and development and testing of the Intensity Frontier Beam Data system for providing NuMI and Booster neutrino beam information to the current and future IF experiments 2011-Present  
 Adaptation of SAM data handling infrastructure for use with the online and offline software system used by IF experiments 2011-Present

**Experiment E907 (MIPP)** 2004-2006  
 Design and implementation of the MIPP trigger system (minimum-bias,  $K/\pi/p/\bar{p}$  particle identification, interaction, calibration and special purpose triggers), development of the specialized (high rate) data acquisition system for beam Čerenkov calibrations. Development of the DAQ software modules for calorimeter, large aperture drift chambers, small aperture beam chambers, and beam Čerenkov systems. Additional development of real-time monitoring, calibration, and efficiency calculation modules for each system. Commissioning, debugging and repair of large aperture drift chambers and associated readout electronics. Commissioning and calibration of hadron calorimeter. Designed and built specialized scintillating fiber cross-hair detector for special purpose triggering and beam alignment during 120 GeV primary beam NuMI target measurements. Designed and wrote the high voltage control and monitoring systems. Supervised, taught and mentored graduate students, on techniques for performing fixed target experiments, including design and operation of common detector systems.

**AGS Experiment E935**, Brookhaven National Laboratory 1997-2003  
 Designed modifications to the E871 trigger system to allow the upgraded experiment (E935) to search for a light gluon/gluino bound state ( $R^0$  hadron). Commissioned and calibrated the lead glass array. Commissioned and calibrated the threshold Čerenkov counter. Commissioned the muon range finder. Wrote Monte Carlo simulations for  $R^0$  decay modes. Performed data analysis on search for  $R^0 \rightarrow \eta\tilde{\gamma}$ .

**AGS Experiment E871**, Brookhaven National Laboratory 1994-1999  
 Initial commissioning of threshold Čerenkov counter. Initial commissioning and debugging of muon range finder and range finder electronics. Monte Carlo simulations. PhD Thesis Analysis:  $B(K_L \rightarrow \mu^+\mu^-e^+e^-)$ .

Tri Universities Nuclear Lab 1996  
 Summer research: N-D breakup in the star configuration.

Thomas Jefferson National Accelerator Facility, Hall A 1996  
 Summer research: Dipole field mapping and zip-track studies.

Thomas Jefferson National Accelerator Facility, Hall B CLAS 1992-1993  
 Undergraduate Summer Internship. Design, fabrication and testing of the E&M Calorimeter fiber optic light guides for the CLAS detector.

**RESEARCHERS SUPERVISED** Pengfei Ding (FNAL Research Associate) 2014-Present  
 Anna Eng (FNAL Target Program) 2011  
 Chad Materniak (Univ. of Virginia PhD Student) 2004-2009

<b>SYNERGISTIC ACTIVITIES</b>	<b>International Conference on Computing in High Energy Physics</b>			
	Track Convener	Data Analysis & Software	Okinawa, Japan	2015
	Track Convener	Data Acquisition & Triggers	Amsterdam, Netherlands	2013
	<b>Neutrino Factories and Future Neutrino Facilities (NuFACT)</b>			
	Track Convener	Muon Physics (WG4)	Rio de Janeiro, Brazil	2015
	Track Convener	Muon Physics (WG4)	Glasgow, Scotland	2014
	Track Convener	Muon Physics (WG4)	Beijing, China	2013
<b>CONFERENCE PRESENTA- TIONS, COLLOQUIUM, SEMINARS</b>	<i>The Nova Experiment: The First 12 months of commissioning, operations and physics data</i>			
	<b>NEUTRINO 2014</b> <sup>1</sup>	Invited Plenary	Boston, MA	2014
	<i>Muon Physics Plans and Questions for 2014</i>			
	<b>NuFact 2014</b> <sup>2</sup>	Working Group Intro.	Glasgow, Scotland	2014
	<i>Muon Physics Summary</i>			
	<b>NuFact 2013</b> <sup>3</sup>	Working Group Summary	Beijing, China	2013
	<i>A <math>\nu_e</math> World at the Intensity Frontier:</i>			
	<b>Wichita State Univ.</b>	Physics Colloquium	Wichita, KS	2012
	<i>Matter, Antimatter and the Ghostly Neutrino</i>			
	<b>Science Cafe Wichita</b> <sup>4</sup>	Invited public talk	Wichita, KS	2012
	<i>The Impact of a Large <math>\theta_{13}</math> on the Long Baseline Neutrino Program at Fermilab</i>			
	<b>Wayne State Univ.</b>	HEP/Astro Seminar	Detroit, MI	2012
	<i>The Impact of a Large <math>\theta_{13}</math> on the Long Baseline Neutrino Program at Fermilab</i>			
	<b>Univ. of Michigan</b>	HEP/Astro Seminar	Ann Arbor, MI	2012
	<i>The Mu2e Experiment and the search for Lepton Flavor Violation</i>			
	<b>BEACH2012</b> <sup>5</sup>	Invited Plenary	Wichita, KS	2012
<i>Project X and the physics of the Intensity Frontier</i>				
<b>BEACH2012</b>	Invited Plenary	Wichita, KS	2012	
<i>The NOvA Experiment, A long-baseline neutrino experiment at the intensity frontier</i>				
<b>HQL2012</b> <sup>6</sup>	Invited Plenary	Prague, CZ	2012	
<i>Project X and the Intensity Frontier</i>				
<b>HQL2012</b>	Invited Plenary	Prague, CZ	2012	
<i>The Nova Data Acquisition System</i>				
<b>CHEP 2012</b> <sup>7</sup>	Parallel talk	New York, NY	2012	
<i>The Nova Timing System</i>				
<b>CHEP 2012</b>	Poster session	New York, NY	2012	
<i>NOvA Event Building, Buffering and Filtering within the DAQ System</i>				
<b>CHEP 2012</b>	Poster session	New York, NY	2012	
<i>The Road to the NOvA Experiment: Status and Prospectus</i>				
<b>NOW 2010</b> <sup>8</sup>	Invited parallel talk	Lecce, Italy	2010	

<i>Precision Searches for Charged Lepton Flavor Violation</i>			
<b>Ohio Univ.</b>	Particle Physics Seminar	Athens, OH	2010
<i>Accessing the Physics Potential of the NOvA Detector</i>			
<b>Fermilab</b>	Computing Division seminar	Batavia, IL	2010
<i>Accessing Particle/Astrophysics Measurements with the NOvA Detector</i>			
<b>Argonne National Lab</b>	HEP seminar	Lemont, IL	2009
<i>The Mu2e Experiment at FNAL</i>			
<b>DPF 2009<sup>9</sup></b>	Invited parallel talk	Detroit, MI	2009
<i>NOvA: The NuMI Offaxis <math>\nu_e</math> Appearance Experiment</i>			
<b>DPF 2009</b>	Invited parallel talk	Detroit, MI	2009
<i>The Mu2e and g-2 Experiments:</i>			
<b>Fermilab Users Meeting</b>	Invited talk	Batavia,IL	2009
<i>NOvA: NuMI Offaxis <math>\nu_e</math> Appearance, Probing the Properties of Neutrinos</i>			
<b>Fermilab Users Meeting</b>	Poster session	Batavia, IL	2008
<i>NOvA: NuMI Offaxis <math>\nu_e</math> Appearance, For the Project X Era</i>			
<b>Project-X Workshop</b>	Poster session	Batavia, IL	2007
<i>NOvA the NuMI Offaxis <math>\nu_e</math> Appearance Experiment</i>			
<b>NuFact07<sup>10</sup></b>	Invited talk	Okayama, Japan	2007
<i>NOvA: NuMI Offaxis <math>\nu_e</math> Appearance, Technical Design and Developments</i>			
<b>Fermilab Users Meeting</b>	Poster session	Batavia, IL	2007
<i>Hadronic Particle Production and the Future of Neutrino Physics</i>			
<b>William and Mary</b>	HEP Seminar	Williamsburg, VA	2005
<i>Measurement of the Branching Fraction for <math>K_L^0 \rightarrow \mu^+ \mu^- e^+ e^-</math></i>			
<b>Univ. of Virginia</b>	HEP Seminar	Charlottesville, VA	2003

**LAB SERVICE  
ACTIVITIES**

Review Committees		
Mu2e Offline Computing Review		2015
$\mu$ BooNE Offline Computing Review		2015
Minerva Computing Infrastructure Review		2014
CMS Disk purchasing committee		2011
Storage Investigation and Review Taskforce		2010
Hiring Committees		
SCD/PPD Hiring Committee	Research Associate	2014
SCD Hiring Committee CHAIR	Applications Physicist	2014
SCD Hiring Committee	Visiting Scientists (Internships)	2014
SCD Hiring Committee	App. Dev. and Sys. Analyst I	2014
SCD Hiring Committee	Comp Phys Dev II	2014
SCD Hiring Committee	Comp Phys Dev I	2013
CD Hiring Committee	System Administrator II	2011

**TEACHING  
POSITIONS****College of William and Mary**

Laboratory Instructor	Introductory Physics (Mechanics)	2000
Discussion Session Instructor	Introductory Physics (E&M)	1998
Discussion Session Instructor	Introductory Physics for Life Sciences	1998
Laboratory Instructor	Introductory Astronomy Laboratory	1998
Graduate Teaching Assistant	Modern Atomic Physics Laboratory	1997
Graduate Teaching Assistant	Introductory Astronomy	1996

**Duke University**

Graduate Teaching Assistant	Introductory Physics for Engineers	1996
Laboratory Instructor	Introductory Physics for Life Sciences	1995

**HONORS**

Society of the Alumni Award	College of William and Mary	1995
Golden Key National Honor Society	College of William and Mary	1994
ΣΠΣ National Honor Society (Physics)	College of William and Mary	1994
Alpha Lambda Delta National Honor Society	College of William and Mary	1992
Phi Eta Sigma National Honor Societies	College of William and Mary	1992

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<sup>1</sup>XXVI International Conference on Neutrino Physics and Astrophysics

<sup>2</sup>XVI International Workshop on Neutrino Factories and Future Neutrino Facilities

<sup>3</sup>XV International Workshop on Neutrino Factories, Super Beams and Beta Beams

<sup>4</sup>Science Cafe Series (<http://www.sciencecafes.org> and <http://sciencecafe-wichita.com/>)

<sup>5</sup>10th International Conference on Beauty Charm Hyperons in Hadronic Interactions

<sup>6</sup>XIth International Conference on Heavy Quarks and Leptons

<sup>7</sup>International Conference on Computing in High Energy and Nuclear Physics

<sup>8</sup>Neutrino Oscillation Workshop

<sup>9</sup>Meeting of the Division of Particles and Fields of the American Physical Society

<sup>10</sup>IX International Workshop on Neutrino Factories, Super beams and Beta beams