

## CURRICULUM VITAE

Robert M. Carey

### Address:

Department of Physics  
Boston University  
590 Commonwealth Ave.  
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### Personal Information:

Nationality – U.S.

### Degrees:

B.A., Harvard University, 1981  
Ph.D., Harvard University 1989

### Professional Positions:

Professor, Boston University	2013-present
Associate Professor, Boston University	2002-2013
Assistant Professor, Boston University	1997-2002
Research Assistant Professor, Boston University	1993-1997
Post-Doctoral Research Assistant, Boston University	1990-1993
Visiting Assistant Professor, Holy Cross College	1989-1990

### Notable Publications:

*Detailed Report of MuLan measurement of the positive muon lifetime and determination of the Fermi constant*, V. Tishchenko *et al.* The MuLan Collaboration, Phys. Rev. D, **87**:5, 2013

*Measurement of Muon Capture on the Proton to 1% Precision and Determination of the Pseudoscalar Coupling  $g_p$* , V. A. Andreev *et al.* (MuCap Collaboration), Phys. Rev. Lett. 110 (2013) 012504.

*Measurement of the Positive Muon Lifetime and Determination of the Fermi Constant to Part-per-Million Precision*, D. M. Webber *et al.* (MuLan Collaboration), Phys. Rev. Lett. 106, 041803, 2011.

*Improved Limit on the Muon Electric Dipole Moment*, G. Bennett *et al.* The Muon  $g-2$  Collaboration, Phys. Rev. D80:052008, 2009.

*Search for Lorentz and CPT Violation Effects in Muon Spin Precession*, G. Bennett *et al.* The Muon  $g-2$  Collaboration, Phys. Rev. Letters, 100:091602, 2008.

*Improved Measurement of the Positive-Muon Lifetime and Determination of the Fermi Constant*, D Chitwood *et al.* (The MuLan Collaboration), Phys. Rev. Letters **99**, 3, July 20, 2007.

*Final report of the Muon E821 Anomalous Magnetic Moment Measurement at BNL*, G. W. Bennett. *et al.*, Physical Review D, **73**,7:DN10185, April 2006.

*Measurement of the Negative Muon Anomalous Magnetic Moment to 0.7 ppm*, G. W. Bennett *et al.*, ( $g-2$ ) Collaboration, Phys.Rev.Lett. **92**:161802,2004.

*Measurement of Anomalous Magnetic Moment of the Positive Muon to 0.7 ppm*, G. W. Bennett *et al.*, ( $g-2$ ) Collaboration, Phys. Rev. Lett. **89**, 101804 (2002).

*Precise Measurement of the Positive Muon Anomalous Magnetic Moment*, H.N. Brown, *et al.*, ( $g-2$ ) Collaboration, Phys. Rev. Lett. **86** 2227, 2001.

### Recent Ph.D. Students:

Justin Phillips (Graduated 2013), Luis Ibanez (Graduated 2015), Xiao Luo (Will Graduate 2016)

### Awards:

NSF Major Research Instrumentation - 2000  
Boston University Neu Family Teaching Award - 2001

### Current Administrative Positions (Physics Department):

Director of Undergraduate Studies  
Chair, Undergraduate Curriculum and Student Affairs  
Advisor to Photon, BU chapter of Society of Physics Students  
GRE Prep session leader

I have served in these positions for most of the last 10 years.

## Research Activities

### MuLan Experiment at the Paul Scherrer Institut (1999-2012): Spokesman

- Best ever measurement (1 ppm) of the Fermi Constant of the Weak Interactions
- More than 150 citations to three principal papers
- Projects Supervised
  1. Design, fabrication and testing of 500 MHz Waveform digitizer for detector readout
  2. Redesign of fast kicker, essential for creating pulsed beam structure (MuLan) or “muons on request” (MuCap, below)
  3. Extensive beam test, commissioning and data production runs at PSI
  4. Simulation of beamline and detector system
  5. Analysis of Pulse Pileup, the largest systematic correction

### MuCap Experiment at the Paul Scherrer Institut (PSI) (2002-2013)

- Best ever measurement (1 %) of the Pseudoscalar Coupling Constant of the Weak Interactions
- 80 citations to two principal papers
- Projects Supervised
  1. Design, fabrication and testing of 500 MHz Waveform digitizer for detector readout (also used in a different mode by MuLan)
  2. Redesign of fast kicker, essential for creating pulsed beam structure (MuLan, above) or “muons on request” (MuCap)
  3. Data production runs at PSI
  4. Independent Lifetime analysis using waveform digitizer data

### MuSun Experiment at the Paul Scherrer Institut (2008-)

- First Precise Measurement (1.5 %) of  $d_R$ , a critical low-energy constant of chiral perturbation theory
- Three PhD theses: Phillips, Ibanez, Luo
- Projects Supervised
  1. New Waveform Digitizer (WFD) Firmware to read out signals from cryogenic TPC
  2. Two range readout and pulse reconstruction - extends dynamic range of WFD for TPC signals
  3. Extensive commissioning and data runs at PSI
  4. Independent electron analysis using waveform digitizer data
  5. Extensive GEANT Monte Carlo modeling of beam line, muon kinetics and TPC response
  6. Template fitting for muon pulses in TPC
  7. Development of Fast Monte Carlo for systematic error studies
  8. Evaluation of numerous systematic errors

## **Muon g-2 experiment at BNL and FNAL**

I have worked on the muon g-2 experiment (in one guise or another) for the past 25 years. Here is a summary of my activities over the past 10 years, on the old BNL experiment and the new one, at FNAL.

- Principal author of the Final Report on the Brookhaven Experiment (2006)  
- more than 1000 citations to date
- Principal author and analysis coordinator for muon electric dipole moment result (2009) - more than 100 citations to date
- Oversaw design of GEANT4 simulation now used by FNAL experiment, combining beamline/injection and detector simulations into a single program: g2ringsim
- Author of Fast Rotation Analysis Program: determines the largest systematic correction to the final result.
- Working with post-doc James Mott and graduate student Nick Kinnaird on GEANE-based tracking - to determine phase space of stored muons.

## **LArIAT experiment at FNAL: June 2016 - Present**

- Test Beam experiment. Characterize performance of liquid argon Time Project Chambers (LArTPCs)
- Key to development of next generation neutrino detectors
- Roles in Project - largely with BU undergraduates.
  1. Upgrade of Time of Flight (TOF) system used in particle identification.
  2. Analysis of Muon Range stack data and evaluation of detector performance.
  3. Introduction of Template Pulse Fitting for photomultiplier data from TOF system and LArTPC.
  4. Study of photon-electron separation algorithms for electron appearance analysis in LArTPCs.