

# Werner M. Sun

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## Education

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**California Institute of Technology, Pasadena, CA**

1995–2003

Ph.D. in Experimental Elementary Particle Physics, June 2003

[Thesis Title: *Observation of  $B \rightarrow K_S^0 \pi^+ \pi^-$  and  $B \rightarrow K^*(892)^\pm \pi^\mp$  and Measurement of the Charge Asymmetry in  $B \rightarrow K^*(892)^\pm \pi^\mp$ ]*

**Harvard University, Cambridge, MA**

1990–1994

A.B., *cum laude*, in Physics, June 1994

## Employment

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**Director of Information Technology, CLASSE, Cornell University, Ithaca, NY** 2013–present

Coordinated development, maintenance, and support of computing infrastructure for the Cornell Laboratory for Accelerator-based Sciences and Education (CLASSE). Led the development of scientific computing strategies, cyberinfrastructure, and training programs to enable the sharing and collaborative reuse of scientific data. Interfaced with scientific and administrative staff to manage the design and implementation of solutions for data acquisition, processing, storage, and archival. Upheld Cornell University policies on information technologies. Supervised technical support staff of approximately ten employees.

**Research Associate, Cornell University, Ithaca, NY**

2003–2013

Searched for new physics in proton-proton collision data collected with the Compact Muon Solenoid (CMS) experiment at the Large Hadron Collider at CERN. Coordinated development of Level-1 trigger emulator and offline database for CMS. Studied  $D$  meson decays in data collected with the CLEO-c detector at the Cornell Electron Storage Ring. Some specific accomplishments and responsibilities:

- Developed generalized least-squares fitting technique with unified treatment of statistical and systematic uncertainties. Applied this technique to CLEO-c data to measure key hadronic  $D^+$  and  $D^0$  branching fractions.
- Led a team of five university groups in investigating the phenomenology of charm mixing in quantum-correlated  $D^0 \bar{D}^0$  pairs, resulting in a new technique for observing  $D^0$ - $\bar{D}^0$  mixing and measuring strong phases in the charm system.
- Convener of CLEO-c physics group on hadronic  $D^0$ ,  $D^+$ , and  $D_s^+$  decays (2005–2012).

- Co-convenor of CMS Level-1 Trigger Software group (2006–2007). Organized and integrated contributions to nine trigger subsystems from physicists at approximately fifteen institutions.
- Offline database coordinator for CMS Level-1 Trigger (2008–present).
- Developed methods for new physics searches using proton-proton collision data collected with CMS.
- Studied the use of jet substructure for distinguishing color-singlet and color-octet quark pairs.
- Optimized CMS software for simulating events with multiple simultaneous proton-proton collisions.
- Supervised summer research project for Cornell’s Research Experiences for Undergraduates program.

**Research Assistant**, *California Institute of Technology, Pasadena, CA*

1995–2003

Studied rare  $B$  meson decays in data collected with the CLEO II and CLEO III detectors at the Cornell Electron Storage Ring. Wrote object-oriented software in C++ for reconstruction of charged particles at CLEO III. Some specific accomplishments:

- Made first observation of the decays  $B \rightarrow K_S^0 \pi^+ \pi^-$  and  $B \rightarrow K^*(892)^\pm \pi^\mp$ , with branching fractions of  $\mathcal{O}(10^{-5})$ , employing a maximum likelihood technique. Also searched for  $CP$  asymmetry in  $B \rightarrow K^{*\pm} \pi^\mp$  and used these measurements to constrain fundamental parameters of the Standard Model of elementary particle physics, including the phase of the Cabbibo-Kobayashi-Maskawa matrix of weak quark couplings.
- Placed limits on light scalar bottom quark production at  $\sqrt{s} \approx 10$  GeV.
- Played key role in design and deployment of object-oriented framework for reconstruction software for the CLEO III experiment.
- Implemented new C++ Kalman filter and least-squares fitter for optimal estimation of charged particle trajectories (tracks) for CLEO III.
- Developed numerous miscellaneous software modules:
  - fast detector simulation
  - pattern recognition algorithm for track reconstruction
  - calibration and clustering algorithm for instrumented drift chamber cathodes
- Built software interface between CLEO III online data acquisition and offline data analysis framework.
- Supervised summer research projects for Cornell’s Research Experiences for Undergraduates program (1998, 2000).

## Selected Publications

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*Search for long-lived particles with displaced vertices in multijet events in proton-proton collisions at  $\sqrt{s} = 13$  TeV*

A. M. Sirunyan *et al.* (CMS Collaboration), Physical Review D **98**, 092011 (2018), arXiv:1808.03078 [hep-ex], doi:10.1103/physrevd.98.092011.

*Research Data Management at CHESS*

D. M. Szebenyi, D. Bougie, A. Finke, R. Gillilan, J. Hopkins, D. Schuller and W. Sun, Acta Cryst. **A73**, a157 (2017), doi:10.1107/S0108767317098440.

*Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC*

CMS Collaboration, Physics Letters B **716**, 30 (2012), doi:10.1016/j.physletb.2012.08.021.

*Updated Measurement of the Strong Phase in  $D^0 \rightarrow K^+\pi^-$  Decay Using Quantum Correlations in  $e^+e^- \rightarrow D^0\bar{D}^0$  at CLEO*

D. M. Asner *et al.* (CLEO Collaboration), Physical Review D **86**, 112001 (2012), arXiv:1210.0939 [hep-ex], doi:10.1103/physrevd.86.112001.

*Determination of the  $D^0 \rightarrow K^+\pi^-$  Relative Strong Phase Using Quantum-Correlated Measurements in  $e^+e^- \rightarrow D^0\bar{D}^0$  at CLEO*

D. M. Asner *et al.* (CLEO Collaboration), Physical Review D **78**, 012011 (2008), arXiv:0802.2268 [hep-ex], doi:10.1103/physrevd.78.012001.

*Determination of the Strong Phase in  $D^0 \rightarrow K^+\pi^-$  Using Quantum-Correlated Measurements*

J. L. Rosner *et al.* (CLEO Collaboration), Physical Review Letters **100**, 221801 (2008), arXiv:0802.2264 [hep-ex], doi:10.1103/physrevlett.100.221801.

*Measurement of Absolute Hadronic Branching Fractions of  $D$  Mesons and  $e^+e^- \rightarrow D\bar{D}$  Cross Sections at the  $\psi(3770)$*

S. Dobbs *et al.* (CLEO Collaboration), Physical Review D **76**, 112011 (2007), arXiv:0709.3783 [hep-ex], doi:10.1103/physrevd.76.112001.

*Time-Independent Measurements of  $D^0$ - $\bar{D}^0$  Mixing and Relative Strong Phases Using Quantum Correlations*

D. M. Asner and W. M. Sun, Physical Review D **73**, 034024 (2006), [Erratum-ibid. **77**, 019901(E) (2008)] arXiv:hep-ph/0507238, doi:10.1103/physrevd.73.034024.

*Simultaneous Least Squares Treatment of Statistical and Systematic Uncertainties*

W. M. Sun, Nuclear Instruments and Methods in Physics Research A **556**, 325 (2006), arXiv:physics/0503050, doi:10.1016/j.nima.2005.10.030.

*Measurement of Absolute Hadronic Branching Fractions of  $D$  Mesons and  $e^+e^- \rightarrow D\bar{D}$  Cross Sections at  $E_{cm} = 3773$  MeV*

Q. He *et al.* (CLEO Collaboration), Physical Review Letters **95**, 121801 (2005), [Erratum-ibid. **96**, 199903 (2006)] arXiv:hep-ex/0504003, doi:10.1103/physrevlett.95.121801.

*Constraints on the CKM Angle  $\gamma$  from  $B \rightarrow K^{*\pm}\pi^\mp$*

W. M. Sun, Physics Letters B **573**, 115 (2003), arXiv:hep-ph/0307212, doi:10.1016/j.physletb.2003.08.046.

*Measurement of the Charge Asymmetry in  $B \rightarrow K^*(892)^\pm \pi^\mp$* 

B. I. Eisenstein *et al.* (CLEO Collaboration), Physical Review D **68**, 017101 (2003), arXiv:hep-ex/0304036, doi:10.1103/physrevd.68.017101.

*Observation of  $B \rightarrow K_S^0 \pi^+ \pi^-$  and Evidence for  $B \rightarrow K^{*\pm} \pi^\mp$* 

E. Eckhart *et al.* (CLEO Collaboration), Physical Review Letters **89**, 251801 (2002), arXiv:hep-ex/0206024, doi:10.1103/physrevlett.89.251801.

*Search for a Scalar Bottom Quark with Mass 3.5–4.5 GeV/c<sup>2</sup>*

V. Savinov *et al.* (CLEO Collaboration), Physical Review D **63**, 051101 (R)(2001), arXiv:hep-ex/0010047, doi:10.1103/physrevd.63.051101.

*Tests of a High Resolution Time-of-Flight System Based on Long and Narrow Scintillator*

E. Chen *et al.*, arXiv:hep-ex/9606007, doi:10.48550/ARXIV.HEP-EX/9606007.

## Presentations and Conference Contributions

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*Visualizing CHES Data with NSDF Dashboards*

W. Sun, National Science Data Fabric All-Hands Meeting, San Diego Supercomputer Center, San Diego, CA, USA, 28 June – 1 March 2024, doi:10.5281/zenodo.10794931.

*Transitioning existing data reduction workflows at the Cornell High Energy Synchrotron Source to Galaxy*

R. Verberg, K. Nygren, K. Soloway, V. Kuznetsov, D. Bougie, and W. Sun, Platform for Advanced Scientific Computing Conference 2023, Davos, Switzerland, 26–28 June 2023, doi:10.5281/zenodo.8132185.

*Threshold Studies of Charm Mixing and Strong Phases with CLEO-c*

W. M. Sun for the CLEO Collaboration, Proceedings of CKM 2012, the 7th International Workshop on the CKM Unitarity Triangle, University of Cincinnati, USA, 28 September – 2 October 2012, eConf C12-09-28, arXiv:1212.5209 [hep-ex].

*A Flavor of Entangled Charm*

Laboratory for Elementary-Particle Physics Journal Club, Cornell University, Ithaca, NY, USA, 1 October 2010.

*Quantum Correlations in Charm Decays*

W. M. Sun for the CLEO Collaboration, Proceedings of PIC 2012, the 30th International Symposium on Physics in Collision, Karlsruhe, Germany, September 1–4, 2010, eConf C12-09-28.

*Semileptonic and Leptonic  $D^0$ ,  $D^+$ , and  $D_s^+$  Decays at CLEO-c*

W. M. Sun for the CLEO Collaboration, Proceedings of the XXXIVth Rencontres de Moriond, QCD and Hadronic Interactions, La Thuile, Valle d'Aosta, Italy, March 14–21, 2009, arXiv:09096.1315 [hep-ex].

*Measurement of the Strong Phase in  $D^0 \rightarrow K^+ \pi^-$  Using Quantum Correlations*

W. M. Sun for the CLEO Collaboration, Proceedings of CHARM07, Ithaca, NY, August 5–8, 2007, eConf C070805, arXiv:0712.0498 [hep-ex].

*Review of Charm Meson Hadronic Decays and Lifetimes*

W. M. Sun for the CLEO Collaboration, Proceedings of the 7th International Conference on Hyperons, Charm and Beauty Hadrons, Lancaster, England, UK, July 2–8, 2006.

 *$D^0\bar{D}^0$  Quantum Correlations, Mixing, and Strong Phases*

W. M. Sun for the CLEO Collaboration, Proceedings of Particles and Nuclei International Conference, Santa Fe, New Mexico, USA, October 24–28, 2005, [arXiv:hep-ex/0603031](#).

*Measurements of Absolute Hadronic Branching Fractions of  $D$  Mesons*

W. M. Sun for the CLEO Collaboration, Proceedings of Particles and Nuclei International Conference, Santa Fe, New Mexico, USA, October 24–28, 2005, [arXiv:hep-ex/0603030](#).

*Absolute Hadronic  $D^0$  and  $D^+$  Branching Fractions at CLEO-c*

CKM 2005 Workshop on the Unitarity Triangle, San Diego, California, USA, March 15–18, 2005.

*Rare Three-Body  $B$  Decays at CLEO*

Laboratory for Elementary-Particle Physics Journal Club, Cornell University, June 2, 2003.

*Charmless Hadronic  $B$  Decays and  $CP$  Asymmetries at CLEO*

W. M. Sun for the CLEO Collaboration, Proceedings of the XXXVth Rencontres de Moriond, QCD and Hadronic Interactions, Les Arcs 1800, France, March 18–25, 2000.

*Evidence for  $B \rightarrow K^{*+}\pi^-$* 

APS Centennial Meeting, Atlanta, Georgia, USA, March 20–26, 1999.

*The Tracking Infrastructure for CLEO III*

A. Lyon *et al.*, Proceedings of Computing in High Energy Physics, Chicago, Illinois, USA, August 31–September 4, 1998.

*Two-Body  $B$  Decays to Kaons and Pions*

APS Meeting, Columbus, Ohio, USA, April 18–21, 1998.