Steven R. Wasserbaech
Curriculum Vitae
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Summary

- Education:
  - Stanford University, 1983–1989, Ph.D. in Physics. Recipient of the Physics Department Fellowship.
  - University of Utah, 1978–1982, B.S. in Mathematics, B.S. in Physics, magna cum laude. Honors at Entrance Scholarship (four years).
- Positions held:
  - Utah Valley University (formerly Utah Valley State College), Department of Physics, Professor, 2007–present; Associate Professor, 2006–2007; Assistant Professor, 2002–2006.
  - European Organization for Nuclear Research (CERN), Scientific Associate, 2009–2010 (on leave from UVU).
  - Haverford College, Department of Physics, Visiting Assistant Professor, 2000–2002.
  - University of Washington, Department of Physics, Research Assistant Professor, 1993–2000.
  - Florida State University, Supercomputer Computations Research Institute, Postdoctoral Research Assistant, 1991–1993.
  - European Organization for Nuclear Research (CERN), Scientific Associate, 1989–1991.
  - Stanford Linear Accelerator Center (SLAC), Research Assistant, 1984–1989.
- Awards:
  - Dean's Faculty Excellence Award—Scholarship, College of Science and Health, Utah Valley University, 2012.
  - Distinguished Faculty Award, College of Science and Health, Utah Valley University, 2009.
  - Board of Trustees Award of Excellence, Utah Valley State College, 2007.
  - Faculty Excellence Award, School of Science and Health, Utah Valley State College, 2005.

- Research specialty: experimental high energy physics.
- Principal experiments:
  - CMS, CERN, Geneva, Switzerland (2009–2017).
  - ALEPH, CERN (1989–2006).
  - DØ, Fermi National Accelerator Laboratory, Batavia, Illinois (1998–2000).
  - Mark III, Stanford Linear Accelerator Center (1984–1989).

Teaching

Utah Valley University / Utah Valley State College

- Elementary physics (introductory level)
- Physics for scientists and engineers I and II (introductory level)
- Modern physics (sophomore level)
- Optics (advanced undergraduate level)
- Particle physics (advanced undergraduate level)
- Classical mechanics (advanced undergraduate level)
- Quantum mechanics I and II (advanced undergraduate level)
- Electricity and magnetism (advanced undergraduate level)
- Electrodynamics (advanced undergraduate level)

Haverford College

- Particle physics (advanced undergraduate level), fall 2000.
- Electronics and waves laboratory (sophomore level), fall 2000 and fall 2001.
- Classical and modern physics 2 (introductory level), spring 2001.
- Quantum mechanics (advanced undergraduate level), spring 2001.
- Fundamental physics 2 (introductory level), fall 2001.
- Introduction to quantum physics (sophomore level), spring 2002.
- Laboratory for classical and modern physics 2 (introductory level), spring 2002.

University of Washington

- Electromagnetism and oscillatory motion (introductory level) and the associated laboratory course, summer 1994.
- High energy physics (graduate course), winter 1996.
- Physics for liberal arts majors, winter 1998.

Service

Live display of the Sun's spectrum as an educational exhibit (2015–present)

- Design of a proposed exhibit for the Pope Science building
  - Feasibility studies
  - Interface of stepper motors, light sensors, shaft encoders, with Raspberry Pi computers; Python programming
  - Mechanical and optical design
  - Ray tracing with WinLens3D and a homemade Fortran program

Lightboard studio (2018–present)

- Creation of studio for video lecture recording
  - Design and construction of lightboard
  - Collaboration with UVU Media Services
  - Studio will be available for use by College of Science faculty

Research

CMS experiment (2009–2017)

- Member of the CMS Publications Committee
  - Responsible for reviewing CMS publication drafts and participating in final readings.
  - Selected as language editor for the paper announcing the discovery of the Higgs boson
  - Selected as language editor for a paper on the properties of the Higgs boson
- Chair of the CMS editorial board for Standard Model Physics
  - Responsible for overseeing the preparation of CMS publications in this topical area.
  - Organized and participated in collaboration-wide reviews and final readings.
  - Served as member of the Publication Committee Steering Board.
- Data quality monitoring
  - Served as supervisor for offline DQM shift operations.
  - Carried out a campaign to make the offline DQM shift instructions clearer, more complete, and more homogeneous across the subsystems.

ALEPH experiment (1989–2006)

- Offline computing.
  - Performed studies and checks related to reprocessing of the ALEPH data sample from LEP 1 with an upgraded reconstruction program.
  - Developed a software package to characterize the geometry of the original and upgraded ALEPH vertex detectors for simulation and reconstruction programs.
  - Developed software for measuring the position and size of the luminous region from reconstructed events and properly simulating these parameters.
  - Developed software for identifying bremsstrahlung photons from electron interactions in the detector material.
  - Mapped the material in the ALEPH tracking detectors by means of converted photons and improved the ALEPH detector simulation on the basis of these measurements.
  - Investigated the effects of bremsstrahlung photons and delta rays on charged track reconstruction in the ALEPH Time Projection Chamber.
  - Performed a Monte Carlo study to investigate the feasibility of measuring the beam position from reconstructed two-photon interactions in ALEPH at LEP 2.
  - Studied raw and reconstructed data for potential systematic effects in precision cross section measurements due to loss or corruption of events in the online computer system.
  - Developed software (in REXX) to automatically monitor data integrity on an IBM mainframe and later migrated the system to unix machines (Korn shell scripts).

- Monitored the offline reconstruction program performance and data integrity.
- Demonstrated that the gain of the ALEPH hadron calorimeter modules depends on their orientation (due to gravity-induced distortions of the modules).
- Developed techniques for offline energy calibration and noise suppression in the hadron calorimeter.
- Wrote code for the ALEPH event reconstruction program.
- Developed a software tool (in DCL, FORTRAN, and REXX) to permit users to fetch selected data from an IBM mainframe for analysis on a VAXstation cluster.
- Participated in the production of Monte Carlo samples for general use within the collaboration.

- Active participant in the editorial process for most publications produced by the ALEPH Collaboration.
- Measurement of the τ lepton lifetime in Z^0 decays observed with the ALEPH detector at the LEP e^+e^- collider.
  - Invented a new method for measuring the lifetime, the impact parameter difference (IPD) method.
  - Leader of the τ lifetime group in the ALEPH Collaboration.
  - Consultant on τ lifetime for the Particle Data Group, 1994 and 1996.
  - Organized a workshop on the τ lifetime for ALEPH physicists, held at CERN in October 1993.
  - Investigated systematic biases in particle lifetime measurements; showed that tracking errors introduce a positive bias on measured decay lengths.
- Studies of leptonic decays of the D_s meson.
  - Initiated the study of $D_s \to \ell\nu$ decays in ALEPH.
  - Supervised a postdoc and a graduate student who measured the branching fractions for $D_s \to \mu\nu$ and $D_s \to \tau\nu$.
  - Debugged the Monte Carlo event generator and developed other software for use in the $D_s \to \ell\nu$ analyses.

DØ experiment (1998–2000)

- Software for level 3 trigger and offline event reconstruction. Development and testing of code in C++ for muon identification and reconstruction in the upgraded DØ detector, to run at the upgraded Tevatron at Fermilab.

Mark III experiment (1984–1989)

- Physics analysis topics included observation of $e^+e^- \to D_s D_s^*$, measurement of the D_s and D_s^* masses, measurement of σB for $D_s^+ \to \phi\pi^+$ and $D_s^+ \to \bar{K}^{*0}K^+$, and study of D_s absolute hadronic branching fractions, with use of data obtained at the SPEAR storage ring at $\sqrt{s} = 4.14\,\text{GeV}$.

- Software development projects (in FORTRAN/MORTRAN and REXX) included a package to apply corrections to charged track momentum measurements for energy loss and multiple Coulomb scattering in the material of the detector.
- Mark III Vertex Detector. Designed and commissioned software and hardware for data acquisition system of a small prototype. Participated in design, assembly, and testing of the vertex detector. Maintained the high voltage distribution system.

Additional research experience

- Developed flexible stripline cables for use in feedthroughs for signal lines of noble liquid calorimeters in the GEM experiment at the SSC and the ATLAS experiment at the LHC (University of Washington).
- Developed simulation and reconstruction software for the SDC experiment at the SSC (Florida State University).

Additional research and teaching positions held

- Stanford University, Department of Physics, Teaching Assistant, introductory courses, 1983–1985.
- University of Utah, Department of Physics, Teaching Assistant, introductory course, 1982.
- University of Utah, Department of Physics, Laboratory Assistant, Cosmic Ray Group, 1979–1983. Designed, assembled, and tested digital electronics for the Fly's Eye experiment. Developed software, including a program to predict which detector elements would be illuminated by bright astronomical objects. Also participated in data collection and analysis.
- University of Utah, Department of Physics, Laboratory Assistant, High Energy Physics Group, 1978. Fabricated light guides for the time-of-flight system of the MAC detector.

Publications in refereed journals, as a principal author

1. *Leptonic decays of the D_s meson,*
   A. Heister *et al.* (ALEPH Collaboration), Phys. Lett. B **528**, 1 (2002).
2. *Updated measurement of the τ lepton lifetime,*
   R. Barate *et al.* (ALEPH Collaboration), Phys. Lett. B **414**, 362 (1997).
3. *Measurement of the τ lepton lifetime with the three-dimensional impact parameter method,*
   R. Barate *et al.* (ALEPH Collaboration), Z. Phys. C **74**, 387 (1997).
4. *Measurement of the τ lepton lifetime,*
   D. Buskulic *et al.* (ALEPH Collaboration), Z. Phys. C **70**, 549 (1996).
5. *Systematic biases in particle lifetime measurements,*
   S. Wasserbaech, Phys. Rev. D **48**, 4216 (1993).
6. *A precise measurement of the τ lepton lifetime,*
   D. Buskulic *et al.* (ALEPH Collaboration), Phys. Lett. B **297**, 432 (1992).
7. *Measurement of the τ lepton lifetime,*
   D. Decamp *et al.* (ALEPH Collaboration), Phys. Lett. B **279**, 411 (1992).
8. *Upper limit on the absolute branching fraction for $D_s^+ \to \phi\pi^+$,*
   J. Adler *et al.* (Mark III Collaboration), Phys. Rev. Lett. **64**, 169 (1990).
9. *Observation of $D_s^+ \to \bar{K}^0 K^+$ and $D_s^+ \to \bar{K}^{*0} K^+$ and an upper limit on $D_s^+ \to K^0\pi^+$,*
   J. Adler *et al.* (Mark III Collaboration), Phys. Rev. Lett. **63**, 1211 (1989).
10. *The Mark III vertex chamber,*
    J. Adler *et al.*, Nucl. Instrum. Meth. A **276**, 42 (1989).
11. *Observation of $e^+e^- \to D_s^{\pm} D_s^{*\mp}$ at $\sqrt{s} = 4.14\,GeV$,*
    G. Blaylock *et al.* (Mark III Collaboration), Phys. Rev. Lett. **58**, 2171 (1987).
12. *Upper limits for northern hemisphere 10^{15} eV γ ray sources,*
    J. Boone *et al.* (Fly's Eye Experiment), Astrophys. J. **297**, 145 (1985).
13. *Search for 10^{15} eV γ rays from the Crab pulsar and surrounding regions,*
    J. Boone *et al.* (Fly's Eye Experiment), Astrophys. J. **285**, 264 (1984).

Other notable publications in refereed journals

1. *Evidence for the direct decay of the 125 GeV Higgs boson to fermions,*
   S. Chatrchyan *et al.* (CMS Collaboration), Nature Phys. **10**, 557 (2014).
2. *Observation of a new boson with mass near 125 GeV in pp collisions at $\sqrt{s}$ = 7 and 8 TeV,*
   S. Chatrchyan *et al.* (CMS Collaboration), JHEP **06**, 081 (2013).
3. *Study of the mass and spin-parity of the Higgs boson candidate via its decays to Z boson pairs,*
   S. Chatrchyan *et al.* (CMS Collaboration), Phys. Rev. Lett. **110**, 081803 (2013).
4. *A new boson with a mass of 125 GeV observed with the CMS experiment at the Large Hadron Collider,*
   S. Chatrchyan *et al.* (CMS Collaboration), Science **338**, 1569 (2012).
5. *Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC,*
   S. Chatrchyan *et al.* (CMS Collaboration), Phys. Lett. B **716**, 30 (2012).
6. *Measurement of the W boson mass and width in e^+e^- collisions at LEP,*
   S. Schael *et al.* (ALEPH Collaboration), Eur. Phys. J. C **47**, 309 (2006).
7. *Search for neutral MSSM Higgs bosons at LEP,*
   S. Schael *et al.* (ALEPH, DELPHI, L3, and OPAL Collaborations and LEP Working Group for Higgs Boson Searches), Eur. Phys. J. C **47**, 547 (2006).
8. *Branching ratios and spectral functions of tau decays: Final ALEPH measurements and physics implications,*
   S. Schael *et al.* (ALEPH Collaboration), Phys. Rept. **421**, 191 (2005).
9. *Measurement of W-pair production in e^+e^- collisions at centre-of-mass energies from 183 GeV to 209 GeV,*
   A. Heister *et al.* (ALEPH Collaboration), Eur. Phys. J. C **38**, 147 (2004).
10. *Final results of the searches for neutral Higgs bosons in e^+e^- collisions at $\sqrt{s}$ up to 209 GeV,*
    A. Heister *et al.* (ALEPH Collaboration), Phys. Lett. B **526**, 191 (2002).
11. *Measurement of the forward-backward asymmetry in $Z \to b\bar{b}$ and $Z \to c\bar{c}$ decays with leptons,*
    A. Heister *et al.* (ALEPH Collaboration), Eur. Phys. J. C **24**, 177 (2002).
12. *Measurement of the tau polarization at LEP,*
    A. Heister *et al.* (ALEPH Collaboration), Eur. Phys. J. C **20**, 401 (2001).
13. *Observation of an excess in the search for the Standard Model Higgs boson at ALEPH,*
    R. Barate *et al.* (ALEPH Collaboration), Phys. Lett. B **495**, 1 (2000).
14. *Measurement of the Z resonance parameters at LEP,*
    R. Barate *et al.* (ALEPH Collaboration), Eur. Phys. J. C **14**, 1 (2000).

Additional publications in refereed journals:

718 publications with the CMS Collaboration,

261 publications with the ALEPH Collaboration,

23 publications with the Mark III Collaboration.

Other publications

1. *Review of b hadron lifetimes and the width difference* $\Delta\Gamma(B_s^0)$,
   S. Wasserbaech, in proceedings of the IV International Conference on Hyperons, Charm, and Beauty Hadrons, Valencia, Spain, 27–30 June 2000, Nucl. Phys. B (Proc. Suppl.) **93**, 91 (2001).
2. *Review of* τ *lifetime measurements*,
   S. Wasserbaech, in proceedings of the Fifth International Workshop on Tau Lepton Physics, Santander, Spain, 14–17 September 1998, Nucl. Phys. B (Proc. Suppl.) **76**, 107 (1999), hep-ex/9811037.
3. *Leptonic decays of the* D_s *meson and production of orbitally excited D and* D_s *mesons*,
   S. Wasserbaech, in Proceedings of the 29th International Conference on High Energy Physics, Vancouver, BC, 23–29 July 1998; edited by A. Astbury, D. Axen, and J. Robinson (World Scientific, Singapore, 1999).
4. *The new ALEPH silicon vertex detector*,
   D. Creanza *et al.*, Nucl. Instrum. Meth. A **409**, 157 (1998).
5. *Measurements of properties of the* τ *lepton at LEP*,
   S. Wasserbaech, in proceedings of the Tau/Charm Factory Workshop, Argonne, IL, 21–23 June 1995, AIP Conf. Proc. 349; edited by J. Repond (AIP, Woodbury, NY, 1996).
6. *A precise measurement of the* τ *lepton lifetime*,
   S. Wasserbaech, in proceedings of the Second Workshop on Tau Lepton Physics, Columbus, Ohio, 8–11 September 1992; edited by K.K. Gan (World Scientific, Singapore, 1993).
7. *Results on D and* D_s *decays from Mark III*,
   S. Wasserbaech, SLAC-PUB-5012 and in proceedings of the XXIV Rencontres de Moriond: Electroweak Interactions and Unified Theories, Les Arcs, France, 5–12 March 1989, edited by J. Trân Thanh Vân (Editions Frontières, Gif-sur-Yvette, France, 1990).
8. *Hadronic decays of the* D_s^+ *meson*,
   S. Wasserbaech, Ph.D. thesis, Stanford University, SLAC-0345 (1989).
9. *Results on Charmed Meson Decays from Mark III*,
   S. Wasserbaech, SLAC-PUB-4289 and in *Proceedings of the Salt Lake City Meeting*, Third Regular Meeting of the Division of Particles and Fields of the APS, Salt Lake City, Utah, 14–17 January 1987, edited by C. DeTar and J. Ball (World Publishing, Singapore, 1987).

Presentations at conferences

- Invited talk, "A solar spectroscope exhibit at Utah Valley University," Summer Meeting of the American Association of Physics Teachers, Provo, Utah, July 2019.
- Invited talk on the discovery of the Higgs boson, Annual Meeting of the Four Corners Section of the APS, Socorro, New Mexico, October 2012.
- Review talk on b hadron lifetimes and the width difference $\Delta\Gamma(B_s^0)$, IV International Conference on Hyperons, Charm, and Beauty Hadrons, Valencia, Spain, June 2000.
- Invited review talk on physics at LEP 2, Second Meeting of the Northwest Section of the APS, Eugene, Oregon, May 2000.
- Invited review talk on measurements of the τ lepton lifetime, Fifth International Workshop on Tau Lepton Physics, Santander, Spain, September 1998.
- Talk on leptonic decays of the D_s meson and production of orbitally excited charm mesons, on behalf of the ALEPH Collaboration, XXIX International Conference on High Energy Physics, Vancouver, BC, July 1998.
- Review talk on τ physics at LEP, Tau/Charm Factory Workshop, Argonne National Laboratory, June 1995.
- Review talk on universality of the leptonic charged currents, Aspen Winter Conference, January 1995.
- Talk on measurement of the τ lepton lifetime, on behalf of the ALEPH Collaboration, Second International Workshop on Tau Lepton Physics, Columbus, Ohio, September 1992.
- Talk on decays of charmed mesons, on behalf of the Mark III Collaboration, XXIV Rencontres de Moriond: Electroweak Interactions and Unified Theories, Les Arcs, France, March 1989.
- Talk on decays of charmed mesons, on behalf of the Mark III Collaboration, Third Regular Meeting of the Division of Particles and Fields of the APS, Salt Lake City, Utah, January 1987.