

David Vincent Neuffer

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Education:

B. A., B. S. in Mathematics and Astrophysics, University of Rochester (1970)
Ph. D. in Physics, University of California, Berkeley (1977),
thesis on "Parity Violation in Heavy Atoms" (E. D. Commins, thesis advisor)

Postgraduation Experience:

Postgraduate Fellow, Accelerator and Fusion Division, Lawrence Berkeley Laboratory,(1977-1979)
R. R. Wilson Fellow in Accelerator Physics, Fermilab (1979-1983)
Scientist, Accelerator Technology Division, Los Alamos National Laboratory (1983-1990)
Visiting Associate Professor, Physics Dept., Texas A&M University (1984-1986)
Staff Scientist, CEBAF, Newport News, VA, Accelerator Division, (1990-1996)
Guest Scientist, Accelerator Division, Fermilab, Batavia IL (1995-1996)
Scientist II, Accelerator Division and Accelerator Physics Center, Fermilab, Batavia IL (1996-)
Fellow, American Physical Society (1999) "for his many important contributions over the past two decades in advancing the concept of the muon collider."

Scientific Accomplishments:

At Fermilab, I am a leader in theoretical and design studies in the muon collider and neutrino factory R&D. Responsibilities include guiding and participating in efforts on proton-source, targeting and μ -production, collection and cooling, acceleration and collider design. My contributions include studies of beam capture and rf rotation, cooling, acceleration scenarios, and collider lattices. I developed a high-frequency multibunch method that captures both μ^+ and μ^- simultaneously. I also established SBIR partnerships with Muons, Inc. to study gas-filled cavities for muon phase-energy rotation and cooling and to study quasiisochronous muon capture. I participated in the design and development of the NuSTORM proposal for a first muon storage ring neutrino source at Fermilab.

I have also contributed to proton source studies, main injector commissioning, recycler commissioning and development, neutrino source studies, Tevatron upgrade and large hadron collider studies, as well as linear collider studies. I participated in initiation of the μ -e conversion experiment for the post-Tevatron era, where I developed scenarios for accumulating protons for μ production matched to a μ -e target and detector. I also contributed to the ILC damping ring studies.

I was a major contributor to CEBAF-based FEL proposals and designs. I was the lead accelerator scientist in conceptual and reference designs, with central contributions in beam dynamics, lattice design, longitudinal bunching/debunching studies, intensity limitations and instabilities, and injector design development and optimization. CW FEL construction and operation was subsequently quite successful. I also presented beam dynamics studies with design and development of beam lines for CEBAF, particularly in extraction and beam switchyard transport lines, and participated in commissioning.

I developed studies of the coherent instability in the Los Alamos Proton Storage Ring (PSR), including observations of an e-p instability, in agreement with calculations. These calculations showed the conditions for development of the e-p instability, and compared with observational (experimental) studies.

I also contributed to the Los Alamos Advanced Hadron Facility program and proposals, including instability studies, lattice development, impedance measurements, and correction methods.

I provided contributions to large collider design (i. e., SSC and LHC) including solutions for increasing the linear aperture, invention of an interaction-region chromaticity control method, and participation in lattice, stability, and control studies. I participated in their conceptual design studies.

I contributed to the Fermilab Tevatron collider project, including beam-beam interaction studies that indicated, at a critical time, that useful luminosity would not be prevented by "Arnold Diffusion". I also developed stochastic cooling calculations.

I studied beam stability and space charge effects in heavy ion beams for heavy ion fusion, including invention of a self-consistent envelope equation for longitudinal motion with space-charge, with studies of its modes.

Teaching Experience:

Graduate student teaching and research supervision, associated with MSU and Indiana University beam physics. (Pavel Snopok graduated in May 2007 and Alexey Poklonskiy graduated in May 2008, current student is Ao Liu.)

Taught an academic lecture series on $\mu^+ - \mu^-$ Colliders at CERN, including preparation of CERN "yellow book" lecture notes in CERN 99-12. I also taught accelerator physics lectures and tutorials at CEBAF and LANL and Fermilab, at various levels, including assistance of graduate students and postdoctoral students, and mentoring of other scientists. Presented tutorial lectures on beam cooling at ECOOL03 and Snowmass 2001, and Summer School Lectures at NuFACT06, NuFACT07 and NuFACT08 summer schools.

Taught a graduate-level full semester course on accelerator physics at Texas A&M, also taught semester courses in engineering physics for undergraduates. I also initiated an informal seminar series on accelerators at Fermilab.

Some Publications

"Stability of a Self-Consistent Longitudinal Phase Space Distribution under Space Charge Perturbations", **Particle Accelerators** **11**, 23 (1980).

"Principles and Applications of Muon Cooling", **Particle Accelerators** **14**, 75 (1983).

"An Analysis of the Beam-Beam Interaction in High Energy pp(p) Colliders", **Particle Accelerators** **20**, 97 (1987).

"Correction of the Multipole Content of Synchrotrons", **Nucl. Inst. and Methods** **A274**, 400 (1989).

"Observations of a Fast Transverse Instability in the PSR" with E. Colton et al., **Nucl. Inst. and Meth.** **A 321**, 1 (1992).

"High-Power Ultraviolet and Infrared Free Electron Laser for Industrial Processing", Proposal and Reference Design Report, Laser Processing Consortium, May 1994.

" $\mu^+ - \mu^-$ Colliders", CERN "Yellow Book" Report 99-12(1999).

"Introduction to Muon Cooling", **Nucl. Inst. and Meth.** **A 532**, pp. 26-31 (2004).

High-Intensity Muon Beams at Fermilab with the Proton Driver, Proc. NuFACT05, **Nucl. Phys. B** **155**, 349 (2006).

"A Cost-Effective Design for a Neutrino Factory", with J. S. Berg et al., **PRSTAB** **9**, 011001 (2006).

"Accelerator Design Concept for Future Neutrino Facilities", with J. S. Berg et al., RAL-TR-2007-23, **JINST** **4**, **P07001** (2009).

"The First Muon Collider-125 GeV Higgs Factory?", Proc. Advanced Accelerator Concepts, Austin TX, **AIP Conf. Proc.** **1507**, 849 (2012).

"The Muon Front End for the Neutrino Factory", with C. Rogers et al., **Physical Review** **STAB** **16**, 040104 (2013).