MARK S. NEUBAUER

Office: 411 Loomis Laboratory
Phone: (217) 244-3913
msn@illinois.edu

Department of Physics
1110 West Green Street
Urbana, IL 61801

EDUCATION

PhD University of Pennsylvania, Physics — June 2001
Dissertation: *Evidence for Electron Neutrino Flavor Change through Measurement of the ^{8}B Solar Neutrino Flux at SNO*
Advisor: Dr. Eugene Beier

BS Kutztown University, Physics — May 1994
Graduated *Summa Cum Laude*

PROFESSIONAL APPOINTMENTS

University of Illinois at Urbana-Champaign, Urbana, IL USA

Affiliate Professor	Department of Electrical and Computer Engineering	2019 –
Affiliate Professor	National Center for Supercomputing Applications	2018 –
Professor	Department of Physics	2018 –
Associate Professor	Department of Physics	2013 – 2018
Assistant Professor	Department of Physics	2007 – 2013

University of California at San Diego, La Jolla, CA USA

Postdoctoral Fellow	Department of Physics	2003 – 2007

Massachusetts Institute of Technology, Cambridge, MA USA

Postdoctoral Fellow	Department of Physics	2001 – 2003

HONORS AND AWARDS

Breakthrough Prize in Fundamental Physics	2016
Dean's Award for Excellence in Research (U. Illinois)	2013
Fellow, Center for Advanced Study (U. Illinois)	2012 – 2013
NSF Career Award	2011
Fellow, National Center for Supercomputing Applications	2008 – 2009
Arnold O. Beckman Research Award (U. Illinois)	2007
Member, Sigma Xi (Massachusetts Institute of Technology)	2002
Chairman's Teaching Award (University of Pennsylvania)	1995

PROFESSIONAL SERVICE

Committees / Co-Organizer

Building Collaborations for Machine Learning in HEP Workshop, MIT	2017
Practice & Experience in Advanced Research Computing (PEARC17) Workshop	2017
Fermilab Operational Readiness Review Committee	2017
Chair, *Fostering HEP & Computer Science Collaboration* Workshop, U. Illinois	2016
Open Science Grid Campus Infrastructures Community Committee	2016

RESEARCH HIGHLIGHTS

Diboson Production as a Sensitive Probe of New Physics 2007 – 2019

The search for diboson resonances is a sensitive probe of new physics. My group has been at the forefront of studying diboson production at colliders, producing:

- Stringent limits on the production of new heavy particles decaying to heavy boson pairs (*WW*, *WZ*, *ZZ*, *hW*, *hZ*) and constraints on new physics models predicting these signatures at the LHC [PRD 98 (2018), JHEP 1803 (2018), PLB 765 (2017), JHEP 1609 (2016), PLB 755 (2016), JHEP 1601 (2016), EPJC 76 (2015), EPJC 75 (2015), JHEP 1501 (2015), PLB 737 (2014), PLB 718 (2012), PRL 107 (2011)]
- First measurement of ZZ at a hadron collider [PRL 100 (2008) 201801)]
- First observation of WZ production [PRL 98 (2007) 161801)]

I have also authored two review articles on tests of electroweak physics [RMP 84 (2012) 1477] and diboson physics at colliders [ARNPS 61 (2011) 223]

Higgs Boson Discovery 2012

The ATLAS and CMS experiments announced the discovery of a Higgs boson *h*. This discovery lead to the 2013 Nobel Prize in Physics for its theoretical prediction

- My group contributed to this discovery (5.9σ) [PLB 716 (2012) 1] through analysis of the $h \rightarrow WW^* \rightarrow e\nu\mu\nu$ channel
- My group contributed to the $h \rightarrow WW^*$ observation (6.1σ) [PRD 92 (2015) 012006], providing the most precise single-channel measurement of *h* couplings. My graduate student Philip Chang received the 2014 US ATLAS Graduate Student Achievement Award for his work on the $h \rightarrow WW^*$ observation and the *h* couplings measurement

Constraints on Charged Higgs Bosons 2012

Charged Higgs bosons (H^+) often arise in new physics models. Through the work of Allison McCarn (Ph.D. thesis) and Anna Sfyrla, my group lead searches for $H^+ \rightarrow \tau\nu$ in top pair events using a direct mass reconstruction method [JHEP 1206 (2012) 039] and via an apparent violation of lepton universality [JHEP 1303 (2013) 076].

Resolution of a *b*-baryon Lifetime Puzzle 2007

On CDF, I lead an analysis of $\tau(\Lambda_b)$ in exclusive decay $\Lambda_b \rightarrow J/\psi\Lambda$. At the time of publication [PRL 98 (2007) 122001], this was the single most precise measurement of $\tau(\Lambda_b)$ and higher than the previous world average by 3.2σ. Our measurement resolved the "Λ_b Lifetime Puzzle" in favor of earlier theory calculations of $\tau(\Lambda_b)$.

Resolution of the Solar Neutrino Problem 2001

On the SNO experiment, my analysis of ^{8}B solar neutrino data provided first direct evidence for ν_e flavor change, resolving the decades-long "Solar Neutrino Problem". The first SNO paper [*PRL* 87 (2001) 71301] was based on my thesis work and lead to the 2016 Breakthrough Prize in Fundamental Physics and the 2015 Nobel Prize in Physics (A. McDonald and T. Kajita) for observation of ν_e flavor change at SNO.

PUBLICATIONS

Please find a list of publications here, including a list of my selected publications.