

Prof. Ed Kearns

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Research specialties – Experimental Particle Physics

Neutrino physics, proton decay, and particle astrophysics.
Electronics and data acquisition for particle detectors, photodetection,
water Cherenkov technique, liquid argon TPCs.

Appointments

- Professor of Physics, Boston University, 2007-present
- Visiting Professor, Kavli Institute for the Physics and Mathematics of the Universe, University of Tokyo, 2008-present (Joint Appointment)
- Associate Professor of Physics, Boston University, 1999-2007
- Research Assistant/Associate Professor, Boston University, 1992-1999
- Research Associate, Boston University, 1990-1992

Professional preparation

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|---|---------------------|
| ○ Harvard University | Physics, Ph.D. 1990 |
| ○ Harvard University | Physics, M.A. 1984 |
| ○ Massachusetts Institute of Technology | Physics, B.S. 1982 |

Particle Physics Collaborations:

- Super-Kamiokande, K2K, T2K, Hyper-Kamiokande
- LArIAT, EMPHATIC, DUNE
- MiniCLEAN
- MACRO (postdoctoral)
- CDF (graduate student)

Honors

- W.K.H. Panofsky Prize in Experimental Particle Physics, 2021
- Breakthrough Prize in Fundamental Physics, 2015 (shared)
- Universities Research Association (URA) Fellow, 2013
- Department of Energy Intensity Frontier Fellow, 2013
- Fellow, American Physical Society, 2008
- Asahi Prize, 1999 (shared)

Presentations (recent and selected)

- Invited talk, APS Meeting (Online, April 2021)
- Closing summary talk, SNEWS 2.0 Workshop, Sudbury, (June 2019)
- Contributed talk, APS Division of Particles and Fields Meeting, Boston, (August 2019)
- Invited talk, Baryon Lepton Number Violation Workshop (Cleveland, May 2017)
- Invited talk, APS Meeting, Washington, (January 2017)
- Invited lecture and panel discussion on the Nobel Prize, Stockholm U. (December 2015)
- Invited talk, Conference on Science at SURF (Rapid City, May 2015)
- Invited talk, TeVPA/DM (Amsterdam, June 2014)
- Invited plenary talk at NNN Workshop (Kashiwa, Japan, November 2013)
- Invited plenary talk, ICFA Regional Neutrino Meeting (Fermilab, January 2013)
- Summary talk at Lepton Baryon Violation 2011, (Gatlinburg, TN, Sep. 2011)
- Opening plenary talk at NuFACTo9 (Chicago, July 2009)
- Featured speaker at Society of Physics Student Meeting (Boston, March 2009)
- Invited plenary talk at NPO8 (Mito, Japan, March 2008)
- Invited plenary talk at 9th ICFA Seminar (SLAC, October, 2008)

Professional Activities:

Super-Kamiokande

- U.S. Co-spokesperson, Executive Committee
- Atmospheric Neutrino and Proton Decay (ATMPD), Co-convenor
- Electronics Working group, Co-convenor
- Gadolinium Committee, Member
- Hyper-Kamiokande International Steering Committee

LBNE/DUNE

- DUNE Far Detector Electronics Convener
- Interim International Executive Board Member
- LBNE Executive Committee Member
- LBNE Nucleon Decay Physics Working Group Co-Convenor
- LBNE Water Cherenkov Electronics Convener

Conference Organization

- Conference for Undergraduate Women in Physics (CUWIP), Boston University, 2023
- International Neutrino Commission Member, 2014 – present
- XXVI International Conference on Neutrino Physics and Astrophysics, (“Neutrino 2014”), Boston, Co-chair
- XXIV Physics in Collision 2003, Local Co-organizer
- New England Particle Physics Student Retreat, Co-organizer

Lectures

- SLAC Summer Institute: 2022, 2018, 2000
- Neutrino Summer School: 2023, 2007
- Fermilab Academic Lectures, 2014, 2013
- Triangle Universities Research Laboratory, Summer REU Program, 2012, 2010
- New England Particle Physics Student Retreat, 2003, 2005, 2006, 2009

Education and Outreach

- Summer research mentor for Illinois Math and Science Academy students, 2013, 2017
- Saturday Morning Laboratory for Boston area high school students, 2002-2003
- Sponsored summer research for visiting high school student, 2001

Particle Physics Organization, Planning, and Reviews

- Snowmass Community Summer Study, Co-Convener, 2021, 2013
- usparticlephysics.org Content Group, member 2017 – present
- Fermilab Users Executive Committee (elected), 2015-2017, Chair 2016-17
- DOE Review of Argonne National Laboratory, 2015
- Neutrino Scientific Assessment Group (NuSAG), 2006-2007
- Fermilab Long Range Plan Steering Group, Neutrino Co-Chair, 2007-08
- DOE Review of Fermi National Accelerator Laboratory, 2006
- Program Advisory Committee, Homestake Underground Laboratory, 2006
- NSF Panel Review for IceCube Experiment 2003, 2004, 2006, 2007
- Sudbury Neutrino Observatory Science Committee (for NSERC) 1999-2006

Service at Boston University (selected)

- Physics Department Associate Chair, 2017-present
- Graduate Admissions and Recruiting, Chair, 2017-2021
- Seven-year Medical Program Admissions, member, 2011-2019
- Assistant Professor Tenure Mentoring Committees (×5, chair ×2)
- Associate Professor Promotion Committee (chair)
- Junior Faculty Search Committees (×4, chair ×1)
- Colloquium Committee, Chair
- Electronics Design Facility, Chair
- 2009 Department Planning Committee
- 2014 Department Planning Committee
- DOE Umbrella Grant Lead Principal Investigator
- CAS Academic Conduct Committee, 1999-2004

Publications

Due to the collaborative nature of experimental particle physics, I am coauthor on more than 300 papers, often with several hundred coauthors. This is a numerical summary provided by the INSPIRE bibliographic service and a list of selected publications where I was particularly involved, including one where I supervised a student.

Category	Published
Renowned papers (500+ cites) :	26
Famous papers (250-499 cites) :	36
Very well-known papers (100-249):	74
Well-known papers (50-99)	71
Known papers (10-49) :	91
Less known papers (0-9) :	22
Total eligible papers analyzed :	320
Total number of citations :	64,383
Average citations per paper :	201.2
<i>h</i> -index	123

Neutrino Oscillation

[1] “Atmospheric neutrino oscillation analysis with neutron tagging and an expanded fiducial volume in Super-Kamiokande I-V”, T. Wester, *et al.*, submitted to Phys. Rev. D, e-Print: 2311.05105

[2] “Constraint on the matter–antimatter symmetry-violating phase in neutrino oscillations”, K. Abe, *et al.*, [T2K Collaboration] Nature 580 (2020) 7803, 339-344

[3] “Atmospheric neutrino oscillation analysis with external constraints in Super-Kamiokande I-IV”, K. Abe, *et al.*, Phys. Rev. D97 (2018), 072001

[4] “Establishing Atmospheric Neutrino Oscillation”, T. Kajita, E. Kearns, M. Shiozawa, Nucl. Phys. B908, 14 (2016), Special Issue on Neutrino Oscillation

[5] “Observation of Electron Neutrino Appearance in a Muon Neutrino Beam”, K. Abe, *et al.*, Phys. Rev. Lett. 112, 061802 (2014).

Cited for Breakthrough Prize in Fundamental Physics, 2015.

[6] “Evidence for the Appearance of Atmospheric Tau Neutrinos in Super-Kamiokande”, K. Abe, *et al.*, Phys. Rev. Lett. 110, 181802 (2013).

[7] “Indication of Electron-Neutrino Appearance from an Accelerator-Produced Off-Axis Beam”, K. Abe, *et al.*, Phys. Rev. Lett. 107, 041801 (2011).

Cited for Breakthrough Prize in Fundamental Physics, 2015.

[8] “Further study of neutrino oscillation with two detectors in Kamioka and Korea”, F. Dufour, T. Kajita, E. Kearns, K. Okumura, Phys. Rev. D81, 093001 (2010).

[9] “Measurement of Neutrino Oscillation by the K2K Experiment”, M.H. Ahn, *et al.*, Phys. Rev. D 7, 072003 (2006).

[10] “Evidence for muon neutrino oscillation in an accelerator based experiment”,
M.H. Ahn, *et al.*, Phys. Rev. Lett. 94, 081802 (2005).

Cited for Breakthrough Prize in Fundamental Physics, 2015.

[11] “A measurement of atmospheric neutrino oscillation parameters by Super-Kamiokande I”,
Y. Ashie, *et al.*, Phys. Rev. D 71, 112005 (2005).

[12] “Evidence for an oscillatory signature in atmospheric neutrino oscillation”,
Y. Ashie, *et al.*, Phys. Rev. Lett. 93, 101801 (2004).

[13] “Constraints on neutrino oscillations using 1258 days of Super-Kamiokande solar neutrino data”,
Y. Ashie, *et al.*, Phys. Rev. Lett. 86, 5656 (2001).

Cited for Breakthrough Prize in Fundamental Physics, 2015

[14] “Detecting Massive Neutrinos”,
E. Kearns, T. Kajita, and Y. Totsuka, Scientific American 281, 48 (1999).

Cited by <https://www.nobelprize.org/uploads/2018/06/popular-physicsprize2015.pdf>

[15] “Evidence for oscillation of atmospheric neutrinos”,
Y. Fukuda, *et al.*, Phys. Rev. Lett. 82, 1562 (1998).

Cited for Nobel Prize in Physics, 2015; Cited for Breakthrough Prize in Fundamental Physics, 2015.

Nucleon Decay

[16] “Search for proton decay via $p \rightarrow \mu^+ K^0$ and via $p \rightarrow \mu^+ \pi^0$ in 0.37 megaton-years of Super- Kamiokande”,
R. Matsumoto *et al.*, Phys. Rev. D 106, 072003 (2022).

[17] “Search for proton decay via $p \rightarrow e^+ \pi^0$ and via $p \rightarrow \mu^+ \pi^0$ with an enlarged fiducial volume in Super-Kamiokande I-IV”,
A. Tanaka *et al.*, Phys. Rev. D 106, 112011 (2020).

[18] “Neutron-antineutron oscillation search using a 0.37 megaton-years exposure of Super-Kamiokande”,
K. Abe *et al.*, Phys. Rev. D 103, 012008 (2020).

[19] “Search for dinucleon decay into pions at Super-Kamiokande”,
J. Gustafson *et al.*, Phys. Rev. D 91, 072009 (2015).

[20] “Search for proton decay via $p \rightarrow \nu K^+$ using 260 kiloton year data of Super-Kamiokande”,
K. Abe *et al.*, Phys. Rev. D 90, 072005 (2014).

[21] “Search for nucleon decay via $n \rightarrow \bar{\nu} \pi^0$ and $p \rightarrow \bar{\nu} \pi^+$ in Super-Kamiokande”,
K. Abe *et al.*, Phys. Rev. Lett. 113, 121802 (2014).

[22] “Search for Nucleon Decay into Charged Anti-Lepton plus Meson in Super-Kamiokande I and II”,
H. Nishino *et al.*, Phys. Rev. D 85, 112001 (2012).

[23] “Search for Proton Decay via $p \rightarrow e^+ \pi^0$ and $p \rightarrow \mu^+ \pi^0$ in a Large Water Cherenkov Detector”,
H. Nishino, S. Clark *et al.*, Phys. Rev. Lett. 102, 141801 (2009).

[24] “Experimental study of the atmospheric neutrino backgrounds for $p \rightarrow e^+ \pi^0$ searches in water Cherenkov detectors”, S. Mine *et al.*, Phys. Rev. D 77, 032003 (2008).

[25] “Search for nucleon decay via modes favored by supersymmetric grand unification models in [SK I]”, K. Kobayashi, M. Earl, *et al.*, Phys. Rev. D 72, 052007 (2005).

[26] “Search for nucleon decays induced by GUT magnetic monopoles with the MACRO experiment”, M. Ambrosio, *et al.*, Eur. Phys. J. C 26, 163 (2002).

[27] “Search for proton decay through $p \rightarrow \nu K^+$ in a large water Cherenkov detector”, Y. Hayato, M. Earl, *et al.*, Phys. Rev. Lett. 83, 1529 (1999).

Dark Matter

[28] “Search for Cosmic-Ray Boosted Sub-GeV Dark Matter Using Recoil Protons at Super-Kamiokande”, K. Abe, *et al.*, Phys. Rev. Lett. 130 031802 (2023).

[29] “Indirect search for dark matter from the Galactic Center and halo with [Super-Kamiokande]”, K. Abe, *et al.*, Phys. Rev. D 102 072002 (2020).

[30] “Search for Boosted Dark Matter Interacting With Electrons in Super-Kamiokande” C. Kachulis, *et al.*, Phys. Rev. Lett. 120 072002 (2018).

[31] “Measurement of scintillation efficiency for nuclear recoils in liquid argon”, D. Gastler, *et al.*, Phys. Rev. C 85, 065811 (2012).

[32] “Scintillation time dependence and pulse shape discrimination in liquid argon”, W.H. Lippincott, *et al.*, Phys. Rev. C 78, 039901 (2010).

[33] “Search for dark matter WIMPs using upward through-going muons in Super-Kamiokande”, S. Desai, *et al.*, Phys. Rev. D70, 083523 (2004).

Astrophysics

[34] “Search for Astrophysical Electron Antineutrinos in Super-Kamiokande with 0.01% Gadolinium-loaded Water”, M. Morii, *et al.*, Astrophys. J. 938, 35, (2022).

[35] “Searching for Supernova Bursts in Super-Kamiokande IV”, M. Morii, *et al.*, Astrophys. J. 938, 35, (2022).

[36] “Study of TeV neutrinos with upward showering muons in Super-Kamiokande”, S. Desai, *et al.*, Astropart.Phys.29:42-54, (2008).

[37] “High energy neutrino astronomy using upward-going muons in Super-Kamiokande-I”, K. Abe, *et al.*, Astrophys. J. 652, 198 (2006).

[38] “Astrophysical Neutrino Telescopes”, A.B. McDonald, *et al.*, Rev. Sci. Instrum. 75, 293 (2004).

[39] “Final results of magnetic monopole searches with the MACRO experiment”, M. Ambrosio, *et al.*, Eur. Phys. J. C25, 511 (2002).