CURRICULUM VITAE

Dr. Kael Dylan Hanson
Department of Physics & Astronomy
University of Pennsylvania
209 South 33^{rd} Street
Philadelphia, PA 19104 USA
Telephone: (215) 898-8554
e-mail: kaeld@hep.upenn.edu

EDUCATION

1991–2000 The University of Michigan, Horace H. Rackham School of Graduate Studies, Ann Arbor, MI. Ph.D., Physics, February 2000. Dissertation entitled *A Measurement of the Neutrino-Induced Muon Flux at the MACRO Detector*.
Graduate Advisor: Michael. J. Longo

1987–1991 The University of Michigan, College of Literature, Science, and the Arts, Ann Arbor, MI. B.S., Physics, May 1991.

RESEARCH EXPERIENCE

2000–present The University of Pennsylvania, Department of Physics & Astronomy, Philadelphia, PA. Postdoctoral research fellow on AMANDA and IceCube neutrino telescope projects at the South Pole.

1994–1999 The University of Michigan, Department of Physics, Ann Arbor, MI. Graduate research assistant on MACRO, Gran Sasso Labs, Assergi, Italy.

1999 The University of Michigan, Ann Arbor, MI. Graduate research assistant on E871 "HyperCP" experiment, Fermilab, Batavia, IL.

1991 The University of Michigan, Ann Arbor, MI. Research assistant on E683 jet photoproduction experiment, Fermilab, Batavia, IL.

TEACHING EXPERIENCE

1995–1999 The University of Michigan, Department of Physics, Ann Arbor, MI. Graduate teaching assistant for introductory physics labs, four semesters; taught discussion for modern physics course, one semester.

INDUSTRIAL EXPERIENCE

1993 – 2000 Sentec Corporation, Walled Lake, MI. Computer programmer, systems-level and digital signal processing.

AWARDS

1994 INFN Visiting Student Fellowship, Italian Nuclear Physics Institute.

1994 NSF Dissertation Enhancement Award, National Science Foundation.

1991 Rackham Merit Fellowship, Horace H. Rackham School of Graduate Studies.

RESEARCH EXPERIENCE – DETAIL

AMANDA/IceCube Activities

- Member of IceCube Software Requirements Advisory Board.
- AMANDA timing calibration coordinator (2001–present).
- Developed, implemented, and integrated into existing reconstruction software, a simplex minimizer which reduces event reconstruction time by 10X.
- Developed method for calibration of AMANDA optical module timing offsets using cosmic ray muons from the AMANDA data stream.
- Analysis of detector crosstalk that has led to better noise reduction filters being used in AMANDA data analysis.
- Developing the string processor for IceCube and a prototype for the AMANDA "String 18 Project." The string processor is a data acquisition application, implemented in C^{++}, that collects hit information from an array of digital optical modules, collates the hits, and performs a cluster search to trigger on physics events, all in real-time as the data is collected.
- Analysis of AMANDA data for ν_e, ν_μ, and ν_τ shower-like events coincident with gamma ray bursts.

MACRO

- Maintenance of ERP scintillator trigger and readout system hardware.
- Scintillator calibrations.
- Spent one-year in residence at Gran Sasso Labs. Responsible for daily support of detector and data acquisition system, 1994–1995.

E871

- Programmed C^{++} tracking code for analysis of particle decays in spectrometer.
- Wrote event display package.
- Installed downstream muon chambers (PWCs).

E683

- Wrote several monitoring packages in Fortran to periodically readout CAMAC hardware boards.

INDUSTRIAL EXPERIENCE – DETAIL

Sentec Corporation

- Implemented time-delayed neural network structure in C^{++} for complex pattern recognition in audio signals. Programmed Win32 GUI data acquisition program to stream audio input from National Instruments A/D card into neural network filter.
- Using MATLAB, wrote image-processing FFT filters to extract signal from holographic silicon wafer scanning device. Additionally, produced scripts for CCD camera control and control of X/Y-table stepping motor.
- Designed Windows 95 (VxD) protected-mode device driver in C and x86 assembly language to boost I/O performance of portable spectrometer card. Also, wrote Win32 GUI data acquisition program to log data from this driver, process data, and present to operator in real-time scrolling display.
- Wrote Win32 GUI data logger in C^{++} accepting data from a network of remote nephelometer devices.
- Development and debugging of real-time operating system running on 8-bit microcontroller inside nephelometer device.

PUBLICATIONS

1. SEARCH FOR SUPERNOVA NEUTRINO BURSTS WITH THE AMANDA DETECTOR. AMANDA Collaboration (J. Ahrens, *et al.*). Astro. Part. Phys, 16:345-359 (2002)
2. TIME CALIBRATION OF THE AMANDA NEUTRINO TELESCOPE USING COSMIC RAY MUONS. AMANDA Collaboration (D. Cowen, and K. Hanson, *et al.*). To appear in Proceedings of the XXVII ICRC, Hamburg, Germany.
3. MATTER EFFECTS IN UPWARD GOING MUONS AND STERILE NEUTRINO OSCILLATIONS. MACRO Collaboration (M. Ambrosio *et al.*). Submitted to Phys. Lett. B. e-Print Archive: hep-ex/0106049.
4. OBSERVATION OF HIGH-ENERGY NEUTRINOS USING CERENKOV DETECTORS EMBEDDED DEEP IN ANTARCTIC ICE. AMANDA Collaboration (E. Andres *et al.*). Nature 410:441-443 (2001)
5. RESULTS FROM THE AMANDA HIGH-ENERGY NEUTRINO DETECTOR. AMANDA Collaboration (E. Andres *et al.*). Nucl. Phys. Proc. Suppl. 91:423-430 (2000) e-Print Archive: astro-ph/0009242.
6. SEARCH FOR MASSIVE RARE PARTICLES WITH MACRO. MACRO Collaboration (M. Ambrosio *et al.*). e-Print Archive: hep-ex/0009002
7. LOW-ENERGY ATMOSPHERIC MUON NEUTRINOS IN MACRO. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Lett. B478:5-13 (2000)
8. NEUTRINO ASTRONOMY WITH THE MACRO DETECTOR. MACRO Collaboration (M. Ambrosio *et al.*). Astrophys. J. 546:1038-1054 (2001)
9. A SEARCH FOR LIGHTLY IONIZING PARTICLES WITH THE MACRO DETECTOR. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Rev. D62:052003 (2000)
10. RELEVANCE OF THE HADRONIC INTERACTION MODEL IN THE INTERPRETATION OF MULTIPLE MUON DATA AS DETECTED WITH THE MACRO EXPERIMENT. MACRO Collaboration (M. Ambrosio *et al.*). Nucl. Phys. Proc. Suppl. 75A:265-268 (1999)
11. NUCLEARITE SEARCH WITH THE MACRO DETECTOR AT GRAN SASSO. MACRO Collaboration (M. Ambrosio *et al.*). Eur. Phys. J. C13:453-458 (2000)
12. HIGH STATISTICS MEASUREMENT OF THE UNDERGROUND MUON PAIR SEPARATION AT GRAN SASSO. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Rev. D60:032001 (1999)
13. LIMITS ON DARK MATTER WIMPS USING UPWARD GOING MUONS IN THE MACRO DETECTOR. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Rev. D60:082002 (1999)
14. ATMOSPHERIC NEUTRINO INDUCED MUONS IN THE MACRO DETECTOR. MACRO Collaboration (F. Ronga *et al.*). Nucl. Phys. Proc. Suppl. 77:117-122 (1999)
15. STUDY OF PHOTONUCLEAR INTERACTION OF MUONS IN ROCK WITH THE MACRO EXPERIMENT. MACRO Collaboration (G. Battistoni *et al.*). e-Print Archive: hep-ex/9809006
16. MEASUREMENT OF THE ENERGY SPECTRUM OF UNDERGROUND MUONS AT GRAN SASSO WITH A TRANSITION RADIATION DETECTOR. MACRO Collaboration (M. Ambrosio *et al.*). Astropart. Phys. 10:11-20 (1999)
17. OBSERVATION OF THE SHADOWING OF COSMIC RAYS BY THE MOON USING A DEEP UNDERGROUND DETECTOR. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Rev. D59:012003 (1999)
18. MEASUREMENT OF THE ATMOSPHERIC NEUTRINO INDUCED UPGOING MUON FLUX USING MACRO. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Lett. B434:451-457 (1998)
19. PARTICLE PRODUCTION AT 0 DEGREES FROM THE COLLIDER. K.W. Del Signore, H.R. Gustafson, K.D. Hanson, L.W. Jones, M.J. Longo, F. Lopez (Michigan U.), S. Berridge, W.M. Bugg,

H. Cohn, Yu. Efremenko, E.L. Hart, Yu. Kamyshkov, A. Weidemann (Tennessee U.), B. Hanna, M. Martens, J. Streets (Fermilab), C.C. Taylor (Case Western Reserve U.), J. Matthews (Louisiana State U.). FERMILAB-P-0899 `http://www.fnal.gov/projects/zdp` Spokesperson: M.J. Longo.

20. THE OBSERVATION OF UPGOING CHARGED PARTICLES PRODUCED BY HIGH-ENERGY MUONS IN UNDERGROUND DETECTORS. MACRO Collaboration (M. Ambrosio *et al.*). Astropart. Phys. 9:105-117 (1998)

21. EXPERIMENTAL STUDY OF HADRONIC INTERACTION MODEL USING COINCIDENT DATA FROM EAS-TOP AND MACRO. MACRO Collaboration (M. Ambrosio *et al.*). Nucl. Phys. Proc. Suppl. 70:483-485 (1999)

22. REAL TIME SUPERNOVA NEUTRINO BURST DETECTION WITH MACRO. MACRO Collaboration (M. Ambrosio *et al.*). Astropart. Phys. 8:123-133 (1998)

23. MAGNETIC MONOPOLE SEARCH WITH THE MACRO DETECTOR AT GRAN SASSO. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Lett. B406:249-255 (1997)

24. SEASONAL VARIATIONS IN THE UNDERGROUND MUON INTENSITY AS SEEN BY MACRO. MACRO Collaboration (M. Ambrosio *et al.*). Astropart. Phys. 7:109-124 (1997)

25. PERFORMANCE OF THE MACRO DETECTOR AT GRAN SASSO: MOON SHADOW AND SEASONAL VARIATIONS. MACRO Collaboration (M. Ambrosio *et al.*). Nucl. Phys. Proc. Suppl. 61B:180-184 (1998)

26. PERFORMANCE OF THE TRANSITION RADIATION DETECTOR OF THE MACRO EXPERIMENT. MACRO Collaboration (M. Ambrosio *et al.*). Nucl. Phys. Proc. Suppl. 61B:289-294 (1998)

27. HIGH-ENERGY COSMIC RAY PHYSICS WITH THE MACRO DETECTOR AT GRAN SASSO: PART 2. PRIMARY SPECTRA AND COMPOSITION. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Rev. D56:1418-1436 (1997)

28. HIGH-ENERGY COSMIC RAY PHYSICS WITH THE MACRO DETECTOR AT GRAN SASSO: PART 1. ANALYSIS METHODS AND EXPERIMENTAL RESULTS. MACRO Collaboration (M. Ambrosio *et al.*). Phys. Rev. D56:1407-1417 (1997)

29. THE PERFORMANCE OF MACRO LIQUID SCINTILLATOR IN THE SEARCH FOR MAGNETIC MONOPOLES WITH $10^{-3} < \beta < 1$. MACRO Collaboration (M. Ambrosio *et al.*). Astropart. Phys. 6:113-128 (1997)

30. PERFORMANCE OF THE MACRO STREAMER TUBE SYSTEM IN THE SEARCH FOR MAGNETIC MONOPOLES. MACRO Collaboration (M. Ambrosio *et al.*). Astropart. Phys. 4:33-43 (1995)

31. ATMOSPHERIC NEUTRINO FLUX MEASUREMENT USING UPGOING MUONS. MACRO Collaboration (S. Ahlen *et al.*). Phys. Lett. B357:481-486 (1995)

32. VERTICAL MUON INTENSITY MEASURED WITH MACRO AT THE GRAN SASSO LABORATORY. MACRO Collaboration. (M. Ambrosio *et al.*). Phys. Rev. D52:3793-3802 (1995)