Michinari Sakai

Personal Data

Place of Birth:	Los Angeles, USA
Address:	60 N. Nimitz Hwy. #1107 Honolulu, HI 96817 USA
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Education

Dec. 2015 (expected)	Ph.D. in Physics, Univ. of Hawaii, Manoa Thesis: "High Energy Neutrino Analysis in KamLAND and Application to Dark Matter Search" GPA: 3.97/4.00 Advisor: Prof. John G. Learned
Aug. 2005 - Aug. 2006	Graduate Program in Mathematics, Sun Moon Univ., S. Korea GPA: 4.50/4.50 Advisor: Prof. Doe-Wan Kim
Aug. 2005	Double B.S. in Physics and Mathematics, Sun Moon Univ., S. Korea Honors: Summa Cum Laude, GPA: 4.33/4.50 Advisor: Prof. Ki-Won Kim

Work Experience

Aug. 2009 - *Current* — Research Assistant

KamLAND: Developed directional reconstruction algorithm for high-energy neutrinos and conducted track reconstruction and particle identification studies in liquid scintillator. First ever physics application (dark matter search) of neutrino directionality in scintillator experiments.

mini-TimeCube: Lead GEANT4 simulation developer for project. Examined trade studies for various neutron capture dopants in scintillator. Contributed to neutrino/neutron directional reconstruction algorithm. Conducted background studies for long-lived isotopes produced from cosmogenic muons.

Aug. 2007 - May. 2009 — Teaching Assistant

Taught two undergraduate physics mechanics laboratory courses per semester. Received positive reviews.

Jan. 2003 - Mar. 2006 — Interpreter and Teacher

(Mar. 2006) Part time English lecturer for Korean undergraduate students.

(Mar. 2004 - Dec. 2005) Part time contributing reporter and translator for campus magazine.

(Jul. 2004) Spontaneous trilingual interpreter for W-CARP International Education Conference.

(Mar. 2003 - Mar. 2004) Part time translator for magazine Today's World.

Skills

Software/Tools:	ROOT, Geant4, Pads, AutoCAD
Programming Languages:	C++, Python, Fortran, Perl, Mathematica, Matlab, Bash, VHDL
Human Languages:	English, Japanese, Korean

Scholarships and Awards

2004	Award for Outstanding Academic Achievement, Samsung Corp.
2001, 2002, 2003, 2004	Undergraduate Achievement Scholarships, Sun Moon Univ.
2001	Ae-Guk Freshman Scholarship, Sun Moon Univ.

Publications

mini-TimeCube

2015 (expected) V.A. Li et al., mini-TimeCube, RSI Invited Review

KamLAND

2015 (expected) K. Asakura et al., Search for the Proton Decay Mode $p \to \overline{\nu} K^+$ with KamLAND, Phys. Rev. D

Mar. 2015 K. Asakura et al., Study of electron anti-neutrinos associated with gamma-ray bursts using KamLAND, arXiv:1503.02137v1

Feb. 2015 T.I. Banks et al., A compact ultra-clean system for deploying radioactive sources inside the KamLAND detector, 10.1016/j.nima.2014.09.068

Jan. 2015 C. Lane et al., A new type of Neutrino Detector for Sterile Neutrino Search at Nuclear Reactors and Nuclear Nonproliferation Applications, arXiv:1501.06935v1

May 2014 A. Gando et al., 7Be Solar Neutrino Measurement with KamLAND, arXiv:1405.6190v1

Aug. 2011 S. Abe et al., Measurement of the 8B Solar Neutrino Flux with the KamLAND Liquid Scintillator Detector, 10.1103/PhysRevC.84.035804

Aug. 2011 J. Kumar, J.G. Learned, M. Sakai, S. Smith, Dark Matter Detection With Electron Neutrinos in Liquid Scintillation Detectors, Phys. Rev. D84 (2011) 036007

Posters and Talks

Jul. 2015 Talk for DOE review, Honolulu, Hawaii, High Energy Analysis and Application to Dark Matter Search in KamLAND

Jun. 2012 Poster at Neutrino 2012, Kyoto, Japan, Indirect Dark-Matter Detection Through KamLAND

Nov. 2010, 2011 Talks at Univ. of Hawaii campus open house, Honolulu, Hawaii, What is a Neutrino?, mini-TimeCube: The World's Smallest Neutrino Detector

Aug. 2010 Talk at AAP 2010, Sendai, Japan, mini-TimeCube: A Portable Directional Neutrino Detector

Sep. 2009 Talk for DOE review, Honolulu, Hawaii, KamLAND Summary

Jul. 2009 Talk at International Neutrino Summer School, Fermilab, Student presentation: How to solve θ_{23} degeneracy

Statement of Research Interests and Experience

My main interest has been in directional neutrino reconstruction and its applications such as indirect dark matter searches, directional geo-neutrino measurements, and anti-nuclear proliferation techniques that involve locating the position of the source.

I have been involved with three projects during my graduate studies at University of Hawaii with my advisor Prof. John Learned; the 1 kt liquid scintillator neutrino experiment KamLAND in Japan, a portable 2.2 L plastic scintillator neutrino experiment called the mini-TimeCube, and a third related to scintillator R&D for a future 10 kt-scale deep-sea based neutrino detector HanoHano.

My work in KamLAND has involved developing directional event reconstruction methods for high-energy ∼GeV scale neutrinos and applying this to conduct an indirect dark matter search by looking at neutrinos from the Earth's core. Studies done with Monte Carlo suggest that the accuracy of reconstructing the neutrino direction using this method is better than that of water-Cherenkov detectors by ∼10° for energies ∼1 GeV and greater. This method is now being tested against events spilling into KamLAND from the T2K neutrino beam-line and the initial results are consistent with what is expected. I believe this is a first ever physics application of neutrino directionality in a scintillator experiment.

In addition, I have worked as the lead GEANT4 simulation designer for the mini-TimeCube collaboration to conduct case studies for optimizing the detector design, test candidate neutron capture doping elements in plastic scintillator, and simulate the response of the multi-channel-plate (MCP) PMTs deployed in the detector. These studies were used during construction of the detector, and to develop directional algorithms that are now being tested in analysis of neutrons from test sources as well as neutrinos from nuclear reactors. I have also conducted simulation studies for cosmic-ray muons and long-lived cosmogenic background isotopes such as ^{8}He and ^{9}Li. These backgrounds are extremely difficult to tag due to their long life-time (>∼s scale) and travel distances. The studies have been vital to the project. Working with the mini-TimeCube project has further involved designing and fabricating PCB boards as well as contributing to the FPGA firmware for the readout electronics.

Finally, my work in scintillator R&D for HanoHano has been designing and building apparatus using CAD for measuring light output of LAB based liquid scintillators when put in large electric potential gradients as well as testing their light transmissivity under extreme temperatures and pressures such as those found in deep-sea environments.

I believe my graduate studies have already given me ample experience in physics analysis and simulation techniques. As a post-doctorate researcher, I am looking for an integrated work environment where I can get hands-on experience with detector hardware, electronics, and firmware development while, at the same time, applying my skills in simulation and analysis.

References

John G. Learned — Professor, Univ. of Hawaii, +1-808-956-2964, jgl@phys.hawaii.edu
Kunio Inoue — Professor, Tohoku Univ./RCNS, +81-22-795-6727, inoue@awa.tohoku.ac.jp
Jason Kumar — Assoc. Professor, Univ. of Hawaii, +1-808-956-2972, jkumar@phys.hawaii.edu
Jelena Maricic — Assoc. Professor, Univ. of Hawaii, +1-808-956-7176, jelena@phys.hawaii.edu