Michinari Sakai

Personal Data

Place and Date of Birth:	Los Angeles, USA | 16 October 1980
Address:	60 N. Nimitz Hwy. #1107, Honolulu, HI, USA
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Education

Dec. 2015 (expected)	Ph.D. in Physics, **University of Hawaii**, Manoa Thesis: "High Energy Neutrino Analysis in KamLAND and Application to Dark Matter Search" Advisor: Prof. John G. Learned
Aug. 2005 - Aug. 2007	Graduate Program in Mathematics, **Sun Moon University**, S. Korea Advisor: Prof. Doe-Wan Kim
Aug. 2005	Dual B.Sc. in Physics and Mathematics, **Sun Moon University**, S. Korea Honors: Summa Cum Laude in both Physics and Mathematics Advisor: Prof. Ki-Won Kim

Work Experience

Aug. 2009 - *Current* — Research Assistant

KamLAND: Developed directional reconstruction algorithm for high-energy neutrinos. 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
Programming Languages:	C++, Python, Fortran, Perl, Mathematica, Matlab, Bash, VHDL
Human Languages:	English, Japanese, Korean

Scholarships and Awards

2004	Award for Outstanding Academic Acheivement, 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

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

Aug. 2010	Talk at AAP 2010, Sendai, Japan: mini-TimeCube: A Portable Directional Neutrino Detector
Jun. 2012	Poster at Neutrino 2012, Kyoto, Japan: Indirect Dark-Matter Detection Through KamLAND

Statement of Research Interests and Experience

My main interest lies 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 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 $\sim$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 the water-Cherenkov detectors by $\sim 10°$ for energies $\sim$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 to 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 and test candidate

neutron capture doping elements in plastic scintillator. 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 long-lived background isotopes such as ^{8}He and ^{9}Li produced by cosmogenic muons. These backgrounds are extremely difficult to tag due to their long life-time ($>\sim$s scale) and long travel distances. The studies have been vital to the project. Working with the mini-TimeCube project has further involved fabricating test boards using the Pads PCB design suit and 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 electromagnetic potential gradiants as well as testing their light transmissivity when placed under extreme pressures (such as those found in deep-sea environments).