Hatice Akkurt

Oak Ridge National Laboratory
P.O. Box 2008, MS 6170
Oak Ridge, TN 37831

Office: 865-576-9143
Cell: 865-250-9997
email: akkurth@ornl.gov (W)
email: akkurt_hatice@yahoo.com (P)

Education

Ph.D. in Nuclear Engineering and Radiological Sciences, 2002, University of Michigan
Dissertation: *Composition Analysis of Large Samples with PGNAA Using a Fixed Point Iteration*

Certificate of Complex System Studies, 2001, University of Michigan

M.S. in Nuclear Engineering, 1998, University of Texas at Austin
Thesis: *MCNP Benchmark Calculations for Mixed Oxide Lattices of the ESADA Plutonium Program*

M.S. in Nuclear Engineering, 1996, Hacettepe University, Turkey
Thesis: *Development of a Control Model for a PWR*

B.S. in Nuclear Engineering, 1994, Hacettepe University, Turkey

Research Interests

Neutron and Photon Transport Problems
Inverse Problems
Radiation Protection and Shielding
Computational Dosimetry
Monte Carlo Methods and Applications
Reactor Analysis and Criticality Calculations
Radiation Detection and Measurements

Experience

Oak Ridge National Laboratory
7/2005-present *Research and Development Staff*

- Developing models and a software package for the assessment of radiation dose using mathematical, voxel, and hybrid phantom models. Developing a user interface, based on Java using Java3d routines, for generation, visualization, and analysis of the models. The package is coupled to MCNP for radiation transport simulations. The software is sponsored by the NRC for the assessment of dose to workers as well as for educational and training purposes.
- Working on the feasibility and design studies for a high temperature down-hole tool, based on nuclear methods, for geothermal

applications. The project involves diverse set of activities including neutron and photon detector measurements, environmental tests for shock and vibration, and modeling and simulation. The project involves staff members from five different divisions and as the principal investigator of the project, responsible for the coordination of efforts among team members, coordination of measurements, and the lead for modeling and simulation activities.

- Worked on a project for which the objective was to develop an algorithm to determine the water content and depth for Lunar and Planetary characterization purposes. Also, planned and coordinated a series of measurements in collaboration with the industry, NASA, and universities for benchmarking and validation.
- Worked on a variety of projects including cross section and code validation, criticality and shielding calculations, depletion calculations, and dose calculations toward revision of Federal Guidance Report (FGR-12) for EPA.
- Hosted and mentored several students as summer interns.
- Worked on the preparation of proposals for different sponsors, project management and budgeting in PI role, coordination of efforts among team members, coordination of program and project reviews, and interactions with the sponsors.

1/2002-7/2005 **Princeton Technology Center, Schlumberger**
Nuclear Modeler (1/2002-6/2003)/Senior Nuclear Modeler (6/2003-7/2005)

- Worked on concept and feasibility studies for new tool and algorithm development for oil-well logging problems. Performed steady-state and time-dependent neutron and photon transport computations, for oil-well logging tools, using MCNP and McBend Monte Carlo codes.
- Setup a Linux cluster for performing parallel MCNP computations and was the system administrator for the system.
- Developed a user interface program using HTML and JavaScript to generate MCNP inputs for oil-well logging tools.
- Coordinated laboratory measurements to characterize tool response and to benchmark computational results. Performed data analysis for these measurements.
- Participated in feasibility and design studies of using an instrument, similar to oil-well logging tools with pulsed neutron generators, for Lunar and Planetary characterization purposes. This work was a collaborative team effort between scientist and engineers from NASA, several universities, and institutions.
- Elected as Schlumberger Eureka Nuclear Modeling Community leader in 2004 and re-elected in 2005. Responsibilities included creating and maintaining an internal web site for computational tools, evaluation of

codes and new releases, preparation of semi-annual community newsletter, and organization of annual Nuclear Community meeting.

6/1999-12/2001 **University of Michigan,** Nuclear Engineering and Radiological Science Dept.
Graduate Research Assistant

- Worked on a project for the mathematical and computational modeling aspects of large sample Prompt Gamma Neutron Activation Analysis (PGNAA) for material characterization purposes.
- Developed an iterative algorithm, which solves the composition problem for large samples using a combination of measured and computed quantities.
- Tested the developed method with proof-of-principle measurements.
- Performed sensitivity analysis studies to determine the robustness of the method.

5/2000-8/2000 **Argonne National Laboratory-West (ANL-W)**
Summer Intern

- Organized and performed neutron activation measurements for large samples to test and validate the developed algorithm.

1/1997-6/1999 **University of Texas at Austin,** Nuclear Engineering Department
Graduate Research/Teaching Assistant

- Worked on a project for the Disposition of Excess Weapon Plutonium and Plutonium Utilization in Water Reactors in the form of MOX fuel. Performed criticality benchmark computations using MCNP for this project. Performed sensitivity calculations using CSAS1X module of SCALE.
- Assisted in teaching undergraduate courses in engineering computational methods and programming.

1/1994-12/1996 **Hacettepe University,** Nuclear Engineering Department
Graduate Research/Teaching Assistant

- Developed a FORTRAN program to simulate a PWR with all components.
- Improved the control model using neural networks.
- Assisted in teaching heat transfer, thermodynamics, nuclear reactor engineering, and reactor analysis courses at the undergraduate level.

Publications

Radiation Protection and Dosimetry

H. Akkurt, D. Wiarda, K. Eckerman, "Radiation Estimation Toolkit Using Phantom Models," NUREG/CR, under review by the U.S. Nuclear Regulatory Commission, Oak Ridge, Tenn., expected final publication date: December 2012.

H. Akkurt, D. Wiarda, K. Eckerman, "Recent Updates to Radiation Dose Estimation Software: PIMAL," *Trans. Am. Nucl. Soc,* **104**, 635-636, 2011 [**Received RPSD Best Professional Paper Award**].

H. Akkurt, D. Wiarda, K. Eckerman, "Radiation Dose Estimation Using Realistic Postures with PIMAL," *Trans. Am. Nulc. Soc*., **103**, 637-638, (2010).

H. Akkurt, K. Bekar, K. Eckerman, "Estimation of Patient and Physician Doses in Interventional Cardiology Using ICRP Male Phantom and Hybrid Phantom VOXMAT," presented at the RPSD-2010 meeting, Las Vegas, NV, April 19-23, 2010.

T. Miller, **H. Akkurt**, B. Patton, "Personnel Dose Assessment during Active Interrogation," presented at the RPSD-2010 meeting, Las Vegas, NV, April 19-23, 2010.

H. Akkurt, K. Bekar, K. Eckerman, "Assessment of Organ Doses for a Glovebox Worker Using Realistic Postures with PIMAL and VOXMAT," *Trans. Am. Nucl. Soc*, **101**, 671–673, 2009.

H. Akkurt, K. B. Bekar, and K. F. Eckerman, "Development of Hybrid Computational Phantom for Radiation Dose Assessment," presented at the ICRS-11 & RPSD-2008, Pine Mountain, GA, April 13–18, 2008.

H. Akkurt, K. B. Bekar, and K. F. Eckerman, "Preliminary Results for VOXMAT: Phantom Model with Combination of Voxel and Mathematical Geometry," *Trans. Am. Nucl. Soc*. **98**, 475-476 (2008).

H. Akkurt and K. F. Eckerman, "Development of PIMAL: Mathematical Phantom with Moving Arms and Legs," ORNL/TM-2007/14, Oak Ridge National Laboratory (May 2007).

H. Akkurt and K. F. Eckerman, "Estimation of Radiation Dose for a Sitting Phantom Using PIMAL," *Trans. Am. Nucl. Soc*. **97**, 458-460 (2007).

H. Akkurt, K. F. Eckerman, J. C. Wagner, and S. Sherbini, "PIMAL: Computational Phantom with Moving Arms and Legs," *Trans. Am. Nucl. Soc*. **96**, 396-397 (2007) [**invited**].

H. Akkurt, D. Wiarda, A. M. Fleckenstein, and K. F. Eckerman, "A GUI for Computational Phantom with Freely Moving Arms and Legs," *Trans. Am. Nucl. Soc*. **96**, 640-641 (2007).

H. Akkurt and K. F. Eckerman, "VOXMAT: Hybrid Computational Phantom for Dose Assessment," *Trans. Am. Nucl. Soc*. **96**, 642-643 (2007).
H. Akkurt, J. C. Wagner, and K. F. Eckerman, "Hand-Held Instruments for Landmine Detection: View from Radiation Dosimetry," *Nuclear Instruments and Methods in Physics Research A* **579**, 391-394, 2007.

Characterization for Logging Problems (Oil & Geothermal)

J. Neal, L. Boatner, Z. Bell, **H. Akkurt**, M. McCarthy, "Evaluation of Neutron and Gamma Detectors for High Temperature Logging Applications," *Proc. of 2nd IEEE Future of International Instrumentation Workshop*, Oak Ridge, TN, November 6-7, 2011.

L. Boatner, J. Neal, Z. Bell, J. Kolopus, **H. Akkurt**, "The Characterization of Scintillator Performance at Elevated Temperatures up to 400°C," presented at the 2011 MRS Spring Meeting, San Francisco, CA, April 25-29, 2011 [**invited**].

H. Akkurt, "Investigation of Neutron Detector Response to Varying Temperature and Water Content for Geothermal Applications," *Trans. Am. Nucl. Soc*, **103**, 204-205, (2010).

H. Akkurt, "Benchmark Results for Monte Carlo Computations of Decay Time Measurements," *Trans. Am. Nucl. Soc.*, **91**, 117-119, 2004.

Planetary Characterization

R. D. Starr, L. G. Evans, A. M. Parsons, J. I. Trombka, J. Groves, **H. Akkurt**, S. R. Floyd, M. Namkung, L. Perkins, P. Wraight, and W. Ziegler, "Combined Gamma-Ray Spectrometer and Pulsed Neutron Generator System for In-Situ Planetary Geochemical Analysis," *Proceedings of the 38th Lunar and Planetary Science Conference,* League City, TX, March 12-16, 2007.

H. Akkurt, J. L. Groves, J. Trombka, R. Starr, L. Evans, S. Floyd, R. Hoover, L. Lim, T. McClanahan, R. James, T. McCoy, J. Schweitzer, "Pulsed Neutron Generator System for Astrobiological and Geochemical Exploration of Planetary Bodies," *Nuclear Instruments and Methods in Physics Research-B,* **241**, 232-237, 2005.

J. I. Trombka, R. D. Starr, J. Groves, **H. Akkurt**, L. G. Evans, T. J. McCoy, A. M. Parsons, J. Schweitzer, E. Amatucci, M. T. Smith, S. Floyd, T. P. McClanahan, "A Pulsed Neutron Gamma-Ray System for Mars Rover Missions", *IEEE 2005 Aerospace Conference Proceedings,* March 2005.

Inverse Problems

J. P. Holloway and H. Akkurt, "The fixed point formulation for large sample PGNAA, Part 1: Theory," *Nuclear Instruments and Methods in Physics Research-A,* **522**, 529-544, 2004.

H. Akkurt, J. P. Holloway, and L. E. Smith, "The fixed point formulation for large sample PGNAA, Part 2: Measurements," *Nuclear Instruments and Methods in Physics Research-A,* **522**, 545-557, 2004.

H. Akkurt and J. P. Holloway, "Sensitivity of the Fixed Point Formulation to Density for Large Sample PGNAA," *Trans. Am. Nucl. Soc.,* **90**, 367-369, 2004.

H. Akkurt and J. P. Holloway, "Sensitivity of the Fixed Point Iteration to Neutron Source Spectrum for Large Sample PGNAA," *Trans. Am. Nucl. Soc.,* **90**, 370-372, 2004.

J. P. Holloway and H. Akkurt, "An Existence proof for a problem in prompt gamma neutron activation analysis", *Proceedings of American Nuclear Society Topical Meeting in Mathematics & Computations, Gatlinburg, TN,* 2003.

H. Akkurt, J. P. Holloway, and L. E. Smith, "Testing the fixed point iteration for composition determination of large samples using PGNAA," *Trans. Am. Nucl. Soc.,* **86**, 388-389, 2002.

H. Akkurt, J. P. Holloway, and L. E. Smith, "A fixed point iteration for large sample prompt gamma analysis," *Trans. Am. Nucl. Soc.*, 85, 2001.

J. P. Holloway and H. Akkurt, "Some aspects of the mathematical modeling of prompt gamma neutron activation analysis," *Proceedings of PHYSOR 2000,* May 2000.

Criticality Calculations

H. Akkurt and N. M. Abdurrahman, "Benchmark calculations of ESADA single region MOX critical experiments," *Nuclear Technology,* **127**, 301-314, 1999.

H. Akkurt, N. M. Abdurrahman, R. T. Primm III, J. M. Barnes, and M. W. Yambert, "Neutronics Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997, ESADA Plutonium Program Critical Experiments: Power Distribution Measurements," ORNL/SUB/99-XSZ175V-5, Oak Ridge National Laboratory, 2001.

H. Akkurt and N.M. Abdurrahman, "Neutronics Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997, ESADA Plutonium Program Critical Experiments: Multi-Region Core Configurations," ORNL/SUB/00-XSZ175V-1, Oak Ridge National Laboratory, 2000.

H. Akkurt and N. M. Abdurrahman, " Neutronics Benchmarks for the Utilization of Mixed-Oxide Fuel: Joint U.S./Russian Progress Report for Fiscal Year 1997, ESADA Plutonium Program Critical Experiments: Single-Region Core Configurations," ORNL/SUB/99-XSZ175V-1, Oak Ridge National Laboratory, 1999.

H. Akkurt and N. M. Abdurrahman, "Criticality benchmark calculations for multi-region (MOX and UO_2) slab core configurations," *Trans. Am. Nucl. Soc.*, **79**, 284, 1998.

H. Akkurt and N. M. Abdurrahman, "Benchmark calculations of ESADA multi-region MOX critical experiments," *Trans. Am. Nucl. Soc.*, **78**, 248, 1998.

N. M. Abdurrahman and H. Akkurt, "Criticality benchmark calculations of ESADA plutonium program with MCNP," *Trans. Am. Nucl. Soc.*, **77**, 368, 1997.

PWR Simulation and Neutral Networks

H. Akkurt and U. Colak, "PWR system simulation and parameter estimation with neural networks", *Annals of Nuclear Energy*, **29**, (17), 2087-2103, 2002.

H. Akkurt, U. Colak, and C. N. Sokmen, "Dynamic Modeling of a PWR, "*Proceedings of the 7th National Congress on Nuclear Sciences and Technology*, Turkey, 1996.

Nuclear Data Validation

D. Wiarda, M. E. Dunn, D. E. Peplow, T. M. Miller, and **H. Akkurt**, "Development and Testing of ENDF/B-VI.8 and ENDF/B-VII.0 Coupled Neutron-Gamma Libraries for SCALE 6", NUREG/CR-6990 (ORNL/TM-2008/047), prepared for the U.S. Nuclear Regulatory Commission by Oak Ridge National Laboratory, Oak Ridge, Tenn., February 2009.

Dissertation and Thesis

H. Akkurt, "Composition Analysis of Large Samples with PGNAA Using a Fixed Point Iteration," *PhD Dissertation*, University of Michigan, 2002.

H. Akkurt, "MCNP Benchmark Calculations for Mixed Oxide Lattices of the ESADA Plutonium Program," MS Thesis, University of Texas at Austin, August 1998.

H. Akkurt, "Development of a Control Model for a PWR," MS Thesis, Hacettepe University, Turkey, December 1996.

Honors and Awards

- ANS Radiation Protection and Shielding Division (RPSD) Best Professional Paper Award, July 2011.
- Nuclear Science and Technology Division Scientific and Technical Achievement Award, December 2006.
- Who's Who in Science and Engineering (2007, 2010), Who's Who in America (2008, 2009, 2011).
- University of Michigan, Rackham Recruitment Fellowship, (September 1999-August 2000).

Professional Society Service Activities

- Member: American Nuclear Society (ANS), IEEE, HPS.
- ANS Publication Committee member 2011-Present
- Secretary of Mathematics and Computation Division (MCD) of ANS 2008-2010
- Arrangements Chair, ANS Oak Ridge/Knoxville Local Section 2006-2007
- Program Chair, ANS Oak Ridge/Knoxville Local Section 2007-2010
- Board Member, ANS Oak Ridge/Knoxville Local Section 2007-2010
- Chaired and co-chaired several sessions at ANS Summer and Winter national meetings and Radiation Protection and Shielding Conference.

Reviewer Activities

- Nuclear Technology 2008-Present
- Applied Radiation and Isotopes 2007-Present
- Nuclear Instruments and Methods in Physics Research-A 2005-Present
- IEEE Transactions on Nuclear Science 2006-Present
- Radiation Protection and Shielding Conference 2006-Present
- ANS Summer and Winter meetings 2006-Present
- ORNL LDRD Proposals 2007-2010
- DOE proposal/project review committee 2009-2011

Students Hosted (Summer Internship)

- Eric Jones, MS Student at Tennessee Tech University, "Assessment of photon production data for detector materials with focus on safeguards measurements," May-July 2010. [Co-mentored with Luiz Leal, Nuclear Data group at ORNL].

- Catherine Frame, MS Student at Vanderbilt University, "Radiation dose estimation using ICRP's voxel phantoms for external exposures," May-July 2010.

- Kursat Bekar, PhD student at Penn State University [currently working as R&D staff member at ORNL].
  - "Exploring Layered Materials with Neutron and Photon Spectroscopy to Determine the Depth and Water Content in Subsurface Layers of Planets," May-Jul, 2007
  - "Hybrid phantom modeling" project, July-September 2007

- Geng Fu, PhD Student at University of Illinois, "Assessment of the impact of new cross section data set on the estimated dose values using MCNP," May-July 2006 [currently working as research scientist at GE Global Research].

Major Grants

- H. Akkurt (PI), Z. Bell, L. Boatner, J. Neal, P.Chiaro, "Feasibility and Design Studies for a High Temperature Downhole Tool," funded by DOE Geothermal Technologies Program, FY 2010-2012, $1,050,000

- H. Akkurt (PI) and K. Eckerman, "Complete Development of PIMAL: Software for Radiation Dose Estimations," funded by NRC, FY 2009-2012, $895,000.

- H. Akkurt (PI) and K. Eckerman, "Development of Hybrid Computational Phantom Model," ORNL LDRD (Seed) Funding, FY 2007-2008, $183,000.

- H. Akkurt (PI), J. P. Holloway, S. Pozzi, "Exploring Layered Materials with Neutron and Photon Spectroscopy to Determine the Depth and Water Content in Subsurface Layers of Planets," ORNL LDRD (Seed) Funding, FY 2006-2007, $175,000.