MARK L. WILLIAMS

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PROFESSIONAL EXPERIENCE

- OAK RIDGE NATIONAL LABORATORY (ORNL), Oak Ridge, Tennessee
  Distinguished Research Staff, Nuclear Science and Technology Division
  2003-present

- LOUISIANA STATE UNIVERSITY (LSU), Baton Rouge, Louisiana
  Professor of Physics and Astronomy, 1999-2003
  Director of Medical Physics Program, 1999-2003
  Director of Nuclear Science Center, 1998-1999
  Professor of Nuclear Engineering, 1991-1999
  Associate Professor of Nuclear Engineering, 1983-1991

- OAK RIDGE NATIONAL LABORATORY, Oak Ridge, Tennessee
  Research Staff, Neutron Physics Division, 1974-1983

EDUCATION

Ph.D. Nuclear Engineering, University of Tennessee, Knoxville, TN, 1979
M.S. Nuclear Engineering, Georgia Institute of Technology, Atlanta, GA, 1974
B.S. Engineering Science, Louisiana State University, Baton Rouge, LA, 1973

TECHNICAL EXPERIENCE

- REACTOR PHYSICS
  - developed CENTRM code for neutron transport calculations with pointwise nuclear data
  - developed LWR lattice physics codes CELL-2/CPM-3 for EPRI
  - reactor calculations with Monte Carlo, SN, and diffusion theory
  - design/analysis of actinide irradiation experiments in EBR-2 and PFR fast reactors

- NUCLEAR DATA
  - knowledgeable about ENDF/B data formats and procedures
  - nuclear data processing with AMPX and NJOY
  - nuclear data testing activities for CSEWG, DOE, NRC

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TECHNICAL EXPERIENCE, *continued*

- RADIATION SHIELDING DESIGN
  - developed "contributon" theory for use in radiation transport analysis
  - shielding design support for FFTF, CRBR, and GCFR fast reactors, fusion reactor blankets, and SP-100 space reactor using SCALE, ANISN, DORT, MCNP, and other codes

- REACTOR PRESSURE VESSEL (RPV) EMBRITTLEMENT STUDIES
  - developed LEPRICON code system for RPV calculations
  - validation studies of U.S. RPV analysis methodology for NRC
  - analyzed numerous PWR and BWR RPV surveillance capsules for commercial utilities

- SENSITIVITY AND PERTURBATION THEORY
  - numerous applications of sensitivity/uncertainty methods to reactor physics, shielding, and depletion calculations
  - developed first perturbation theory for coupled nuclide/flux fields, and adjoint ORIGEN for transmutation applications
  - developed method to treat implicit perturbations due to resonance self-shielding

- MEDICAL PHYSICS
  - photon and electron transport codes for cancer therapy applications
  - deterministic electron transport calculations for LINAC targets

U. S. PATENT

- E. Sajo and M. L. Williams, "Embedded Radiation Emitter for Localization and Dosimetry of Brachytherapy Seed Implants," U.S. Patent 6,761,679 B2, July 13, 2004.

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PROFESSIONAL ORGANIZATIONS

- AMERICAN NUCLEAR SOCIETY:
  - CROSS SECTION EVALUATORS WORKING GROUP (CSEWG):
    - Chairman Thermal Data Testing Subcommittee (1983-96)
    - Executive Committee (1988-1995)

- AMERICAN ASSOCIATION OF PHYSICISTS IN MEDICINE (AAPM)

UNIVERSITY COURSES TAUGHT

NS-2051 Introduction to Nuclear Science; NS-4425 Computational Methods in Nuclear Science; NS-4527 Undergraduate Reactor Physics; NS-4991 Nuclear Science Laboratory; NS-7527 Graduate Reactor Physics-I; NS-7528 Graduate Reactor Physics-II; NS-7529 Reactor Kinetics; NS-7537 Radiation Transport Theory-I; NS-7538 Radiation Transport Theory-II; NS-7555 Numerical Methods of Reactor Analysis; MEDP-7537 Radiation Interactions and Transport; MEDP-7538 Monte Carlo Simulation of Radiation Transport

CONSULTING (while at LSU)

- Oak Ridge National Laboratory
- Electric Power Research Institute
- Pennsylvania Power and Light Company
- Public Service Electric and Gas
- Utility Resource Associates
- American Electric Power Service Corp.
- Consolidated Edison Company of New York
- Tennessee Valley Authority
- Texas Utility Electric Company
- Technology for Energy Corp.
- Siemens Power Corp.
- TransWare Enterprises, Inc.
- Virginia Power
- Southwest Research Institute
- Levy, Inc.
- Baltimore Gas and Electric Company
- Indiana and Michigan Electric Company
- Bechtel Overseas Corp.
- Nuclear Engineering Technology Corp.

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PUBLICATION LISTING

PH.D. DISSERTATION

Williams, M. L., "Perturbation and Sensitivity Theory for Reactor Burnup Analysis," Ph.D. Dissertation, The University of Tennessee, August 1979.

BOOK CHAPTERS

Williams, M. L., "Perturbation Theory for Reactor Analysis," pp. 63-188 in *CRC Handbook of Nuclear Reactors Calculations, Vol. 3*, CRC Press, 1986.

PAPERS IN JOURNALS AND CONFERENCE PROCEEDINGS

1. Sajo, E., and M. L. Williams, “Post-Implant Prostate Dosimetry Without Seed Localization,” *Med. Phys.* **31**(6), 1747 (2004).
2. Williams, M. L., D. Ilas, E. Sajo, D. B. Jones, and K. E. Watkins, "Deterministic Photon Transport Calculations in General 3D Geometry for External Beam Radiation Therapy," *Med. Phys.* **30**(12), 3183-3195 (2004).
3. Williams, M. L., and E. Sajo, “Deterministic Calculations of Photon Spectra for Clinical Accelerator Targets,” *Med. Phys.* **29**(6), 1019-1028 (2002).
4. Williams, M. L., B. L. Broadhead, and C. V. Parks, “Eigenvalue Sensitivity Theory for Resonance Shielded Cross Sections,” *Nucl. Sci. Eng.* **138**, 177-191 (2001).
5. Williams, M. L., “Submoment Expansion of Neutron Scattering Sources,” *Nucl. Sci. Eng.* **134**, 1-9 (2000).
6. Pratt, C. G., and M. L. Williams, “Application and Sensitivity Studies Utilizing Alternate Source Term Dose Methodology,” *Trans. Am. Nucl. Soc.* B, Washington, D.C. (Nov. 2000).
7. Asgari, M., B. Burdick, R. G. Grummer, S. Misa, and M. L. Williams, “Performance of Jeff2.2, ENDF-B/VI, and ENDF-B/V Nuclear Data in LWR Lattice Eigenvalue Calculations,” *Trans. Am. Nucl. Soc.* **83**, 225-228 (2000).
8. Williams, M. L., D. B. Jones, and K. Watkins, “Trends in Deterministic Transport Code Development,” *Trans. Am. Nucl. Soc*., Boston, MA (1999).
9. Williams, M. L., M. Asgari, “The Sub-Moment Expansion Method for Representing Elastic Scattering Sources,” *Trans. Am. Nucl. Soc.*, Nashville, TN (1998).

PAPERS IN JOURNALS AND CONFERENCE PROCEEDINGS, *continued*

10. Williams, M. L. and R. Raharjo, "Space-Dependant Resonance Self-Shielding," *Nucl. Sci. Eng.* **12,** 19-34 (1997).
11. Sajo, E., M. L. Williams, and M. Asgari, "Pressure Vessel Spectrum Analysis of the Czech LRO/VVER-440 Benchmark Experiment," *1996 ANS Topical Meeting on Radiation Protection and Shielding*, No. Falmouth, MA, pp. 181-188, April 21-25, 1996.
12. Williams, M. L., and M. Asgari, "Computation of Continuous-Energy Neutron Spectra With Discrete Ordinates Transport Theory," *Nucl. Sci. Eng.* **121**, 173-201 (1995).
13. Williams, M. L., R. Q. Wright, and M. Asgari, "ENDF/B-VI Performance for Thermal Reactor Analysis," *Trans. Am. Nucl. Soc.* **73**, 420-422 (1995).
14. Williams, M. L., M. Asgari, and R. Tashakorri, "Discrete Ordinates Transport Calculations with Pointwise Cross Section Data," *Proceedings of the 1994 Topical Meeting on Advances in Reactor Physics* **1**, 209-218 (1994).
15. Grow, R. L., M. L. Williams, D. B. Jones, J. R. Fisher, S. P. Baker, and E. L. Fuller, "CPM-3, Improved Lattice Physics Code," *Proceedings of the 1994 Topical Meeting on Advances in Reactor Physics* **1**, 209-218 (1994).
16. Sajo, E., M. L. Williams, and M. Asgari, "Comparison of Measured and Calculated Neutron Transmission Through Steel for a Cf-252 Source," *Annals of Nucl. Energy* **20**, 585-604 (1993).
17. Courtney, J. C., H. Manohara, and M. L. Williams, "Estimates of the Radiation Environment for a Nuclear Rocket Engine," in *Proceedings Nuclear Technologies for Space Exploration*, Jackson Hole, WY, 1992.
18. Williams, M. L., and H. Manohara, "Contributon Slowing Down Theory," *Nucl. Sci.Eng.* **111**, 345-367 (1992).
19. Williams, M. L., C. Aboughantous, M. Asgari, J. E. White, R. Q. Wright, and F. B. K. Kam, "Transport Calculations of Neutron Transmission Through Steel," *Annals of Nucl. Energy* **18**, 549-565 (1991).
20. Williams, M. L., "Generalized Contributon Response Theory," *Nucl. Sci. Eng.* **108**, 355-383 (1991).
21. Williams, M. L., "Reactivity Due to Deformation of a Thin Plate in a Critical Reactor," *Nucl. Sci. Eng.* **108**, 150-171 (1991).
22. Williams, M. L., R. E. Macfarlane, M. Milgram, R. Q. Wright, and A. C. Kahler, "Initial Data Testing of ENDF/B-VI for Thermal Reactor Benchmark Analysis," *Trans. Am. Nucl. Soc.* **64**, 561-562 (1991).
23. Maerker, R. E., and M. L. Williams, "Improvements in Calculational Techniques for Pressure Vessel Dosimetry," *Trans. Am. Nucl. Soc.* **64**, 489-490 (1991).
24. Yucel, A. and M. L. Williams, "Perturbation Theory in Radiative Heat Transfer," *Integral Methods in Science and Engineering*, Arlington, TX (May 1990).
25. Yucel, A., S. Acharaya, and M. L. Williams, "Natural Convection and Radiation in a Square Enclosure," *Numerical Heat Transfer*. **15**(2), 261-277 (1989).
26. Wright, R. Q., M. L. Williams, and C. O. Slater, "Impact of U-235 Evaluation on k_{eff} of Thermal Reactor Systems," *Trans. Am. Nucl. Soc.* **60**, 619-620 (June 1989).
27. Williams, M. L., and R. Q. Wright, "Impact of ENDF/B-VI on Thermal Reactor Benchmark Calculations," *Trans. Am. Nucl. Soc.* **60**, 621-622 (November 1989).
28. Yucel, A., and M. L. Williams, "Interaction of Conduction and Radiation in Cylindrical Geometry Without Azimuthal Symmetry," *Proceedings* of the *25th Nat. Heat Transfer Conf.*, pp. 281-290, Houston, TX (1988).

PAPERS IN JOURNALS AND CONFERENCE PROCEEDINGS, *continued*

29. Williams, M. L., A. Yucel, S. Nadkarny, and M. Asgari, "Two-Dimensional Nuclear Heating Analysis of a Space Reactor Shielding Under Steady-State and Transient Conditions," *Proceedings of the 25th National Heat Transfer Conference*, pp. 417-726, Houston, TX (July 1988).
30. Yucel, A., S. Acharya, and M. L. Williams, "Combined Natural Convection and Radiation in a Square Enclosure," *Proceedings of the 25th National Heat Transfer Conference*, pp. 209-218, Houston, TX (1988).
31. Lindau, C. W., R. D. DeLaune, and M. L. Williams, "Application of N-15 for Simultaneous Estimation of Nitrification and Nitrate Reduction in Soil-Water Columns," *Plant and Soil*, 151-154 (1988).
32. Yucel, A., and M. L. Williams, "Azimuthally Dependent Radiative Transfer in Cylindrical Geometry," *Fundamentals and Applications of Radiation Heat Transfer*, pp. 29-36, 24th National Heat Transfer Conference, Pittsburgh, PA (1987).
33. Yucel, A., and M. L. Williams, "Thermal Radiation Heat Transport Using Discrete Ordinates," *Theory and Practices in Radiation Protection and Shielding* **2**, 523-532 (1987).
34. Williams, M. L., G. M. Marshall, P. Chowdhury, and F. B. K. Kam, "Diffusion Theory Calculations for the Pin-Wise Power Distribution in VENUS-I and VENUS-II," *Sixth ASTM-Euratom Symposium on Reactor Dosimetry*, pp. 314-323, Jackson, WY (June 1987).
35. Yucel, A., and Williams, M. L., "Heat Transfer by Combined Conduction and Radiation in Axisymmetric Enclosures," *J. Thermophys. and Heat Transfer* **1**(4), 301-307 (1987).
36. Yucel, A., and M. L. Williams, "Combined Radiation and Conduction in Axisymmetric Enclosures by the Discrete Ordinates Method," *AIAA/ASME 4th Joint Thermophysics and Heat Transfer Conference*, Boston, MA, June 2-4, 1986.
37. Maerker, R. E., M. L. Williams, and B. L. Broadhead, "Accounting for Time-Dependent Source Variations in LWR Surveillance Dosimetry Analysis," *Nucl. Sci. Eng.* **94**, 291-308 (1986).
38. Maerker, R. E., B. L. Broadhead, B. A. Worley, M. L. Williams, and J. J. Wagschal, "Application of the LEPRICON Unfolding Procedure to the Arkansas Nuclear One-Unit 1 Reactor," *Nucl. Sci. Eng.* **93**, 137-170 (1986).
39. Williams, M. L., P. Morakinyo, F. B. K. Kam, L. L. Leenders, G. Minsart, and A. Fabry, "Calculation of the Neutron Source Distribution in the VENUS PWR Mockup Experiment," *Reactor Dosimetry*, pp. 711-718, J. P. Genthon and H. Rottger (eds.), Reidel Publishing Co., Brussels, 1985.
40. Maerker, R. E., B. L. Broadhead, C. Fu, J. Wagschal, J. Williams, and M. L. Williams, "Combining Integral and Differential Dosimetry Data in an Unfolding Procedure with Application to the Arkansas Nuclear One-Unit 1 Reactor," *Nuclear Data for Basic and Applied Sciences*, pp. 220-224, Santa Fe, NM, May 13-17, 1985.
41. Williams, M. L., R. Q. Wright, B. A. Worley, O. Ozer, and W. J. Eich, "Analysis of Thermal Reactor Benchmarks with Design Codes Based on ENDF/B-V Data," *Nucl. Technol.* **71**(2), 386-401 (1985).
42. Williams, M. L., F. W. Stallmann, R. E. Maerker, and F. B. K. Kam, "Validation of Neutron Fluence Calculations in Benchmark Facilities for Improved Damage Predictions," *Nucl. Eng. and Design* **86**, 87-91 (1985).
43. Eich, W. J., M. L. Williams, and C. M. Peng, "Determination of Effective Reflector and Baffle/Reflector Constants for Few Group Diffusion Calculations," *Nucl. Sci. Eng.* **90**, 127-139 (1985).

PAPERS IN JOURNALS AND CONFERENCE PROCEEDINGS, *continued*

44. Maerker, R. E., B. L. Broadhead, and M. L. Williams, "Unfolded Fluxes in the Arkansas Nuclear One-Unit 1 Reactor Using the LEPRICON Methodology," *Trans. Am. Nucl. Soc.* **49**, 425-428 (1985).
45. Williams, M. L., P. Chowdhury, M. Landesman, and F. B. K. Kam, "In-Core and Ex-Core Calculations of the VENUS Simulated PWR Benchmark Experiment," *Trans. Am. Nucl. Soc.* **50**, 438-439 (1985).
46. Courtney, J. C., and M. L. Williams, "The Value of Some Estimations in Radiation Protection," *Trans. Am. Nucl. Soc.* **50**, 440-441 (1985).
47. Maerker, R. E., B. L. Broadhead, and M. L. Williams, "Recent Progress and Developments in LWR-PV Calculational Methodology," pp. 639-648, *Fifth ASTM-EURATOM Symposium on Reactor Dosimetry*, Geesthacht, Germany (September 1984).
48. Wagschal, J. J., R. E. Maerker, B. L. Broadhead, and M. L. Williams, "Unfolded ANO-1 Fluxes Using the LEPRICON Methodology," pp. 827-838, *Fifth ASTM-EURATOM Symposium on Reactor Dosimetry*, Geesthacht, Germany (September 1984).
49. Ozer, O., R. E. Maerker, M. L. Williams, B. L. Broadhead, J. J. Wagschal, and C. Y. Fu, "LEPRICON – A Systematic Approach to LWR Pressure Vessel Dosimetry," *Proceedings of the Reactor Physics Topical Meeting of ANS*, pp. 276-285, Chicago, IL (October 1984).
50. Williams, M. L., "Relative and Absolute Sensitivity Coefficients in Depletion Perturbation Theory," *Nucl. Sci. Eng.* **88**(4) (1984).
51. Williams, M. L., R. E. Maerker, and F. B. K. Kam, "Validation of Neutron Transport Calculations in Benchmark Facilities for Improved Vessel Fluence Estimation," *Proceedings of the Eleventh Water Reactor Safety Research Conference:* NUREG/CP-0047, pp. 252-253, Gaithersburg, MD (October 1983).
52. Williams, M. L., "Correction of Multigroup Cross Sections for Resolved Resonance Interference in Mixed Absorbers," *Nucl. Sci. Eng.* **32**, 37-49 (1983).
53. Maerker, R. E. and M. L. Williams, "Accounting for the Time-Dependent Source Variations in Surveillance Dosimetry Analysis," ANS 1983 National Winter Meeting, San Francisco, CA, October 1983; *Trans. Am. Nucl. Soc.* **45**, 591-529 (1983).
54. Williams, M. L. and R. E. Maerker, "Calculations of the Startup Experiments at the Poolside Facility," pp. 149-158, *Fourth ASTM-EURATOM Symposium on Reactor Dosimetry*, Gaithersburg, MD (March 1982).
55. White, J. R. and M. L. Williams, "Application of Time-Dependent Generalized Perturbation Theory Methods in LWR Physics Analyses," pp. 297-314, *Advances in Reactor Physics and Core Thermal Hydraulics*, Kiamesha Lake, NY (September 1982).
56. Maerker, R. E. and M. L. Williams, "Calculations of the Westinghouse Perturbation Experiment at the Poolside Facility," pp. 131-142, *Fourth ASTM-EURATOM Symposium on Reactor Dosimetry*, Gaithersburg, MD (March 1982).
57. Ford, W. E., B. R. Diggs, J. R. Knight, N. M. Greene, L. M. Petrie, and M. L. Williams, "CSRL-V ENDF/B-V Library and Thermal Reactor and Criticality Safety Benchmarks," pp. 19.1-19.25, *Symposium on ENDF/B Benchmark Analysis* (May 1982).
58. Maerker, R. E., J. J. Wagschal, B. L. Broadhead, and M. L. Williams, "Development of a Benchmark Data Base for Use in PWR Dosimetry Analysis," *Sixth International Conference on Radiation Shielding*, Tokyo, Japan, May 16-20, 1982.
59. Williams, M. L., R. Q. Wright, J. Barhen, and W. Rothenstein, "Benchmarking of EPRI-CELL Epithermal Methods with the Point-Energy Discrete Ordinates Code (OZMA)," pp. 18.1-18.39, *Symposium on ENDF/B Benchmark Analysis* (May 1982).

PAPERS IN JOURNALS AND CONFERENCE PROCEEDINGS, *continued*

60. Williams, M. L., and D. Gilai, "Incorporation of Clad Effects Into Sauer's Method for Computing Dancoff Factors," *Annals of Nucl. Energy* **9**, 137-140 (1982).
61. White, J. R., T. J. Burns, and M. L. Williams, "On the Implementation Verification and Application of Multicycle Depletion Perturbation Theory," pp. 769-780, *Advances in Reactor Physics and Shielding*, Sun Valley, ID, September 14-17, 1980 (1981).
62. Slater, C. O., S. N. Cramer, D. T. Ingersoll, M. L. Williams, F. J. Muckenthaler, J. J. Manning, and J. L. Hull, "Measurements and Calculation of the Effectiveness of the GCFR Grid Plate Shield," *Nucl. Technol.* **52***(*3), 354-369 (March 1981).
63. Gilai, D., J. H. Cooper, W. R. Laing, S. Raman, P. H. Stelson, R. L. Walker, and M. L. Williams, "Experimental and Calculational Results of an Irradiation Experiment in EBR-II," ANS 1981 National Summer Meeting, Miami, FL, June 7-12, 1981; *Trans. Am. Nucl. Soc.* **38**, 669-671 (1981).
64. Eich, W. J., M. L. Williams, and C. Peng, "Evaluation of ENDF/B-V Based Three-Fast-Group Reflector Constants," ANS 1981 Summer Meeting, Miami, FL, June 7-12, 1981; *Trans. Am. Nucl. Soc.* **38**, 666-667 (1981).
65. Maerker, R. E., and M. L. Williams, "Comparison of Calculations with Neutron Dosimetry Measurements Performed at the Oak Ridge Poolside Facility," ANS 1981 National Winter Meeting, San Francisco, CA, November 29-December 4, 1981; *Trans. Am. Nucl. Soc.* (1981).
66. Eich, W., C. M. Peng, R. Janne, E. Chen, and M. L. Williams, "ENDF/B-V Based Few-Group PWR Baffle/Reflector Constants," ANS 1981 National Winter Meeting, San Francisco, CA, November 29-December 4, 1981; *Trans. Am. Nucl. Soc.* (1981).
67. Cacuci, D. G., J. H. Marable, M. L. Williams, and E. Greenspan, "Developments in Sensitivity Theory," *Advances in Reactor Physics and Shielding*, Sun Valley, ID, 95-101 (September 1980).
68. Kallfelz, J. M., C. L. Cowan, J. H. Marable, C. R. Weisbin, and M. L. Williams, "Design and Sensitivity Analysis of a CDS-Type LMFBR Heterogeneous Core," pp. 80-86, *Advances in Reactor Physics and Shielding*, Sun Valley, ID, September 14-17, 1980.
69. Bowman, S. M., M. L. Williams, and H. L. Dodds, Jr., "Implementation of Generalized Perturbation Theory into the 3-D Nodal Code SIMULATE," ANS 1980 National Summer Meeting, Las Vegas, NV, June 8-13, 1980; *Trans. Am. Nucl. Soc.* **34**, 305-306 (1980).
70. Greenspan, E., M. L. Williams, and J. H. Marable, "Time-Dependent Generalized Perturbation Theory for Coupled Neutron-Nuclide Problems," *Nucl. Sci. Eng.* **73**, 210-218 (1980).
71. Greenspan, E., and M. L. Williams, "Constrained Sensitivity Theory," ANS 1980 National Summer Meeting, Las Vegas, NV, June 8-13, 1980; *Trans. Am. Nucl. Soc.* **34**, 823-824 (1980).
72. Williams, M. L., "Development of Depletion Perturbation Theory for Coupled Neutron/Nuclide Fields," *Nucl. Sci. Eng.* **70**, 20-36 (1979).
73. Williams, M. L., J. R. White, and T. J. Burns, "A Technique for Sensitivity Analysis of Space-and-Energy-Dependent Burnup Calculations," ANS 1979 National Summer Meeting, Atlanta, GA, June 3-8, 1979; *Trans. Am. Nucl. Soc.* **32**, 66-68 (1979).
74. Ozer, Odelli, R. E. MacFarlane, and M. L. Williams, "Implementation of ENDF/B-IV and V Data in LWR Design Codes: EPRI-CELL and EPRI-CPM," ANS National Winter Meeting, San Francisco, CA, November 11-16, 1979; *Trans. Am. Nucl. Soc.* (1979).
75. Schmocker, U., K. Gmuer, H. Graf, M. Jermann, C. McCombie, R. Richmond, S. Seth, D. E. Bartine, D. T. Ingersoll, and M. L. Williams, "Benchmark Experiments with Thorium in Fast Reactor Lattices," *Neutron Physics and Nuclear Data for Reactors and Other Applied Purposes*, Harwell, United Kingdom, Sept. 25-29, 1978.

PAPERS IN JOURNALS AND CONFERENCE PROCEEDINGS, *continued*

76. Williams, M. L., J. R. White, J. H. Marable, and E. M. Oblow, "Sensitivity Theory for Depletion Analysis," RSIC-42, pp. 299-310, *Theory and Application of Sensitivity and Uncertainty Analysis*, Oak Ridge, TN, August 22-24, 1978.
77. Ingersoll, D. T., C. O. Slater, and M. L. Williams, "Design of a Prototypic GCFR Grid Plate Shield Confirmation Experiment," ANS 1978 National Winter Meeting, Washington, DC, November 12-17, 1978; *Trans. Am. Nucl. Soc.* **30**, 706-708 (1978).
78. Williams, M. L., and W. W. Engle, Jr., "Spatial Channel Theory – A Technique for Determining the Directional Flow of Radiation Through Reactor Systems," *Proceedings of the Fifth International Conference on Reactor Shielding*, 770-776 (1977).
79. Engle, W. W., Jr., F. R. Mynatt, M. B. Emmett, and M. L. Williams, "A Summary of the ORNL Shield Design Support Analysis for the FFTF," *Proceedings of the Fifth International Conference on Reactor Shielding*, 44-53 (1977).
80. Williams, M. L., "Comments on The Concept of Spatial Channel Theory Applied to Reactor Shielding Analysis," *Nucl. Sci. Eng.* **63(3)**, 798-799 (1977).
81. Williams, M. L., "The Relations Between Various Contributon Variables Used in Spatial Channel Theory," *Nucl. Sci. Eng.* **64**, 220-222 (1977).
82. Williams, M. L., and W. W. Engle, Jr., "The Concept of Spatial Channel Theory Applied to Reactor Shielding Analysis," *Nucl. Sci. Eng.* **62**, 92-104 (1977).
83. Williams, M. L., and W. W. Engle, Jr., "Analysis of Streaming Through Primary Coolant Pipe Chaseway of the Clinch River Breeder Reactor," ANS 1977 National Winter Meeting, San Francisco, CA, November 27-December 1, 1977; *Trans. Am. Nucl. Soc.* **27**, 779-781 (1977).
84. Williams, M. L., R. T. Santoro, and T. A. Gabriel, "The Calculated Performance of Various Structural Materials in Fusion-Reactor Blankets," *Nucl. Technol.* **29**, 384 (1976).
85. Bettis, E. S., T. J. Huxford, D. J. McAlees, R. T. Santoro, H. L. Watts, and M. L. Williams, "Design of an EPR Fusion Blanket," *Proceedings of the Sixth Symposium on Engineering Problems of Fusion Research*, pp. 111-115 (1975).
86. Kallfelz, J. M., M. L. Williams, D. Lal, and G. F. Flanagan, "Sensitivity Studies of the Breeding Ratio for the Clinch River Breeder Reactor," *Advanced Reactors: Physics, Design and Economics*, Atlanta, GA; J. M. Kalfelz and R. A. Karam, Eds., Pergamon Press, Oxford, pp. 127-138 (1975).
87. Engle, W. W. Jr., M. B. Emmett, and M. L. Williams, "Analysis of the Complex Reactor Cavity Shield in the FTR," ANS 1975 National Winter Meeting, San Francisco, CA, November 16-21, 1975; *Trans. Am. Nucl. Soc.* **22**, 783-784 (1975).
88. Santoro, R. T., E. S. Bettis, H. L. Watts, M. L. Williams, and D. J. McAlles, "Neutronic Scoping Studies for A Tokamak Experimental Power Reactor," ANS 1975 National Winter Meeting, San Francisco, CA, November 16-21, 1975; *Trans. Am. Nucl. Soc.* **22**, 17-19 (1975).
89. Williams, M. L., R. T. Santoro, and T. A. Gabriel, "The Influence of Structural Materials on Fusion-Reactor-Blanket Response," ANS 1975 National Winter Meeting, San Francisco, CA, November 16-21, 1975; *Trans. Am. Nucl. Soc.* **22**, 40-42 (1975).

- **TECHNICAL REPORT PUBLICATIONS**

90. Grossbeck, M., and M. L. Williams, *BWR Vessel and Internals Project: Weldability of Irradiated LWR Structural Components*, EPRI TR-108707, Electric Power Research Institute, September 1997.

TECHNICAL REPORT PUBLICATIONS, *continued*

91. Asgari, M., M. L. Williams, F. B. K. Kam, and E. D. McGarry, *Transport Calculations of Radiation Exposure to Vessel Support Structures in the Trojan Reactor*, NUREG/CR-6071 (prepared for U.S. Nuclear Regulatory Commission), Oak Ridge National Laboratory, Oak Ridge, TN (1994).
92. Williams, M. L., M. Asgari, and F. B. K. Kam, *Impact of ENDF/B-VI Cross Section Data on H.B. Robinson Cycle 9 Dosimetry Calculations*, NUREG/CR-6071 (prepared for U.S. Nuclear Regulatory Commission), Oak Ridge National Laboratory (1993).
93. Williams, M. L., C. Aboughantous, M. Asgari, J. E. White, R. Q. Wright, and F. B. K. Kam, *Transport Calculations of Neutron Transmission Through Steel*, NUREG/CR-5648 (prepared for U.S. Nuclear Regulatory Commission), Oak Ridge National Laboratory, Oak Ridge, TN (1991).
94. Williams, M. L., M. Asgari, and R. L. Childs, *Analysis of H.B. Robinson Reactor Vessel Fluence for Cycle 10 Utilizing Partial Shield Assemblies*, ORNL/TM-11476, Oak Ridge National Laboratory, Oak Ridge, TN (1990).
95. Asgari, M., M. L. Williams, and F. B. K. Kam, *Determination of the Neutron and Gamma Flux in the Pressure Vessel and Cavity of a Boiling Water Reactor*, ORNL/TM-11350, Oak Ridge National Laboratory, Oak Ridge, TN (1990).
96. Iddings, F. A., M. L. Williams, and M. Asgari, *Reactor Vessel Surveillance Program for Sequoyah Unit-2 Reactor: Analysis of Capsule U*, SwRI Report 17-8851, Southwest Research Institute, December 1989.
97. Nair, P. K., and M. L. Williams, *Reactor Vessel Material Surveillance Program for Angra Dos Reis Unit 1: Analysis of Capsule V*, SwRI Final Report 06-8976, Southwest Research Institute, June 1989.
98. Williams, M. L., *Validation of ENDF/B-V CELL-2 Calculations for Predicting the Isotopic Content of Exposed LWR Fuel*, EPRI NP-6440, Electric Power Research Institute, July 1989.
99. Iddings, F. A., D. G. Cadena, and M. L. Williams, *Reactor Vessel Materials Surveillance Program for Indian Point Unit No. 2: Analysis of Capsule V*, SwRI Final Report 17-2108, Southwest Research Institute, October 1988.
100. Nair, P. K., and M. L. Williams, *Pressure-Temperature Limits for Calvert Cliffs Nuclear Power Plant Unit-1*, SwRI Final Report 06-1278, Southwest Research Institute, June 1988.
101. Williams, M. L., A. Yucel, and S. Nadkarny, *DOS-HEATING6: A General Conduction Code with Nuclear Heat Generation Derived from DOT-IV Transport Calculations*, ORNL/TM-10645, Oak Ridge National Laboratory, Oak Ridge, TN (May 1988).
102. Nair, P. K., M. L. Williams, and M. Asgari, *Pressure Temperature Limits for Calvert Cliffs Nuclear Power Plant Unit 2*, SwRI Final Report 06-1278-002, Southwest Research Institute, May 1988.
103. Nair, P. K., and M. L. Williams, *Reactor Vessel Material Surveillance Program for Donald C. Cook Unit No. 2: Analysis of Capsule X*, SwRI Report 06-1278-001, Southwest Research Institute, April 1988.
104. Kam, F. B. K., R. E. Maerker, M. L. Williams, and F. W. Stallmann, *Pressure Vessel Fluence Analysis and Neutron Dosimetry*, NUREG/CR-5049 (prepared for the Nuclear Regulatory Commission), Oak Ridge National Laboratory, Oak Ridge, TN, December 1987.
105. Chowdhury, P., M. L. Williams, and F. B. K. Kam, *Development of a Three-Dimensional Flux Synthesis Program and Comparison with 3-D Transport Theory Results*, NUREG/CR-4984 (prepared for the U.S. Nuclear Regulatory Commission), Oak Ridge National Laboratory, Oak Ridge, TN, January 1988.

TECHNICAL REPORT PUBLICATIONS, *continued*

106. Ozer, O., R. E. Macfarlane, and M. L. Williams, *ARMP-02 Documentation: Part II, Chapter 2: Description of the CELl-2 Fast and Thermal Cross Section Libraries*, EPRI NP-4574, Electric Power Research Institute, October 1987.
107. Maerker, R. E., B. L. Broadhead, B. A. Worley, M. L. Williams, and J. J. Wagschal, *Application of the LEPRICON Methodology to the Arkansas Nuclear One-Unit 1 Reactor*, EPRI NP-4469, Electric Power Research Institute, February 1986.
108. Williams, M. L., and L. F. Miller, *Computational Methodology for the Oak Ridge Research Reactor (ORR) and Bulk Shielding Reactor (BSR): The VICTOR Input Processing Code for the BOLD VENTURE System, Vol. II*, NUREG/CR-3064, Vol. 2, U.S. Nuclear Regulatory Commission, April 1986.
109. Miller, L. F., and M. L. Williams, *Computational Methodology for the Oak Ridge Research Reactor [ORR] and Bulk Shielding Reactor [BSR]: Cross Section Generation and Validation, Vol. I*, NUREG/CR-3064, Vol. 1, U.S. Nuclear Regulatory Commission, March 1986.
110. Williams, M. L., B. A. Worley, R. Q. Wright, *Validation of Cell Analysis Capability using ENDF/B-V Nuclear Data*, EPRI NP-4806, Electric Power Research Institute, Final Report, September 1986.
111. Nair, P. K., E. B. Norris, and M. L. Williams, *Susquehanna Reactor Unit-1 Dosimeter Testing*, SwRI Report 06-8658, Southwest Research Institute, September 1986.
112. Nair, P. K., and M. L. Williams, *Reactor Vessel Surveillance Program Results for Sequoyah Unit-1*, SwRI Report, Southwest Research Institute, October 1986.
113. Maerker, R. E., M. L. Williams, B. L. Broadhead, J. J. Wagschal, and C. Y. Fu, *Revision and Expansion of the Database of the LEPRICON Dosimetry Methodology*, EPRI NP-3841, Electric Power Research Institute, January 1985.
114. Williams, M. L., I. Remec, and F. B. K. Kam, *Neutron Spectral Characterization Neutronics Calculations*, CR-4031, U.S. Nuclear Regulatory Commission, March 1985.
115. Morakino, P., M. L. Williams, and F. B. K. Kam, *Analysis of the VENUS PWR Engineering Mockup Experiment – Phase I: Source Distribution*, NUREG/CR-3888, U.S. Nuclear Regulatory Commission, August 1984.
116. Eich, W. J., C. M. Peng, and M. L. Williams, *Few Group Baffle and/or Reflector Constant for Diffusion Calculation Application*, EPRI NP-3642-SR, Electric Power Research Institute, August 1984.
117. Williams, M. L., R. E. Maerker, W. E. Ford, and C. C. Webster, *The ELXSIR Cross Section Library for LWR Pressure Vessel Irradiation Studies*, EPRI NP-3654, Electric Power Research Institute, September 1984.
118. Williams, M. L., R. Q. Wright, and J. Barhen, *Development of Improved Methods for the LWR Lattice Physics Code EPRI-CELL*, ORNL/TM-8411, Oak Ridge National Laboratory, Oak Ridge, TN, July 1982.
119. Maerker, R. E., and M. L. Williams, *Calculations of Two Series of Experiments Performed at the Poolside Facility Using the Oak Ridge Research Reactor*, NUREG/CR-2696 (ORNL/TM-8326), Oak Ridge National Laboratory, Oak Ridge, TN, May 1982.
120. Williams, M. L., R. W. Wright, and J. Barhen, *Improvements in EPRI-CELL Methods and Benchmarking of the ENDF/B-V Cross Section Library*, EPRI NP-2416, Electric Power Research Institute, Project 975-3, June 1982.
121. Gilai, D., M. L. Williams, J. H. Cooper, W. R. Laing, R. L. Walker, S. Raman, and P.H. Stelson, *Experimental and Calculational Analysis of Actinide Samples in EBR-II*, ORNL-5791, Oak Ridge National Laboratory, Oak Ridge, TN (1982).

TECHNICAL REPORT PUBLICATIONS, *continued*

122. Williams, M. L., *Perturbation and Sensitivity Theory for Reactor Burnup Analysis*, ORNL/TM-7096, Oak Ridge National Laboratory, Oak Ridge, TN, December 1979.
123. Williams, M. L., G. W., McAdoo, and G. F. Flanagan, *Preliminary Neutronic Study of Actinide Transmutation in a Fast Reactor*, ORNL/TM-6309, Oak Ridge National Laboratory, Oak Ridge, TN, August 1978.
124. Williams, M. L., and C. R. Weisbin, *Sensitivity and Uncertainty Analysis for Functionals of the Time-Dependent Nuclide Density Field*, ORNL-5393 (ENDF-263), Oak Ridge National Laboratory, Oak Ridge, TN, April 1978.
125. Jenal, J. P., P. J. Erickson, W. A. Rhoades, D. B. Simpson, and M. L. Williams, *The Generation of a Computer Library for Discrete Ordinates Quadrature Sets. Part I: Fully Symmetric Quadratures and the DOQDP Computer Code. Part II: Common Quadratures and the Quadrature Library*, ORNL/TM-6203, Oak Ridge National Laboratory, Oak Ridge, TN, October 1977.
126. Williams, M. L., and F. B. Sadler, *The FANG Angular Folding Code for Channel Theory Analysis*, ORNL/TM-5228, Oak Ridge National Laboratory, Oak Ridge, TN, August 1977.
127. Williams, M. L., and W. W. Engle, *The Concept of Spatial Channel Theory Applied to Reactor Shielding Analysis*, ORNL/TM-5467, Oak Ridge National Laboratory, Oak Ridge, TN, July 1976.
128. Santoro, R. T., E. S. Bettis, D. G. McAlees, H. L. Watts, and M. L. Williams, *Neutronic Scoping Studies for the Tokamak Experimental Power Reactor*, ORNL/TM-5035, Oak Ridge National Laboratory, Oak Ridge, TN, February 1976.
129. Williams, M. L., R. T. Santoro, and T. A. Gabriel, *The Calculated Performance of Various Structural Materials in Fusion-Reactor Blankets*, ORNL/TM-5036, Oak Ridge National Laboratory, Oak Ridge, TN, December 1975.