

ABSTRACT:

Innovations in 3-Dimensional Neutronics Analysis for Fusion Systems

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Recent advances in radiation transport simulation tools enable an increased fidelity and accuracy in modeling complex geometries. Future neutronics calculations for design and analysis will increasingly be based directly on 3-D CAD geometries. The DAGMCNPX software permits the direct use of CAD-based solid models in MCNP(X). In addition to improving the workflow for simulating complex 3-D geometries, it allows a richer representation of the geometry compared to the standard 2nd-order polynomial representation. The DAGMCNPX project is one of 4 tools being compared as part of an ITER benchmark activity to develop confidence in CAD-based neutronics tools. In the meantime, it is being used for 3-D modeling of the ARIES Compact Stellarator, HAPL final optics, and high-fidelity modeling of ITER first wall and shield modules. These tools, examples of their application, and expected future advances will be discussed.

Bio—Paul Wilson joined the University of Wisconsin-Madison's Engineering Physics department as an assistant professor in August 2001 as part of the Energy Systems and Policy Hiring Initiative. His research interests bring together technical and policy issues: analysis methods of isotopic inventories in nuclear systems and the implications on nuclear non-proliferation policy, and the development of next generation nuclear power systems to fulfill a role in future energy policy and needs. He began his graduate schooling in nuclear engineering at the University of Wisconsin-Madison. After three years, he moved to Karlsruhe, Germany, where he studied in the Institute for Neutron Physics and Reactor Engineering, earning his Dr.-Ing. degree in Mechanical Engineering in 1998. Returning to Madison, Paul completed his Ph.D. in Nuclear Engineering in 1999. Paul was the founding President of the North American Young Generation in Nuclear [NA-YGN], an organization created to provide unique opportunities to young professionals in all fields of nuclear science & technology. Paul has been active in the American Nuclear Society since 1994, and represented the ANS and NA-YGN at the international climate change negotiations in Buenos Aires, Argentina (1998), and Bonn, Germany (1999).