NSTD The Nuclear Science and Technology Division

SEMINAR ANNOUNCEMENT

TITLE: A New Approach to the Iterative Solution of Transport Problems

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A new approach to solve iteratively the transport equation is introduced. This new iterative scheme is unlike any other approach. The scheme decomposes the transport solution into particular, asymptotic and transient components, with these components coupled at the problem boundaries, and at the interfaces between material of different scattering ratio. The solution's decomposition is based on the Case-mode structure of the transport solution space and exploits the characteristics of each component. Asymptotic modes, which slowly vary in space and angle are assigned to a global diffusion solver. Transient modes, which are only significantly present in the region surrounding boundary and material interfaces, are assigned to a local transport solver. This approach reduces the transport problem to the transient component, and promises considerable advantages for solvers in parallel architectures. Results are presented in one dimension, with a transport solver discretized with either a method from the Family of Continuous Finite Elements, and or a Discontinuous Finite Element Method. Numerical results confirm that the method converges in few iterations, especially if the mesh is only refined as little as needed to obtain a targeted accuracy. Extension to multiple dimensions remains being a challenge, but these initial results are encouraging.