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Abstracts of Papers to Appear in Future Issues

PERTURBATION THEORY IN LIGHT-CONE QUANTIZATION. Alex Langnau and Stanley J. Brodsky. *Stanford Linear Accelerator Center, Stanford University, Stanford, California 94309, U.S.A.*

A new algorithm for the automatic computation of Feynman diagram amplitudes in quantum field theory is presented. Once the topology of a diagram is defined, the algorithm constructs all corresponding light-cone time-orderings. We explore the method for two- and three-loop calculations in QED.

TRANSPORT OF GYRATION-DOMINATED SPACE PLASMAS OF THERMAL ORIGIN 2: NUMERICAL SOLUTION. Á. Kőrösmezey, C. E. Rasmussen, and T. I. Gombosi. *Space Physics Research Laboratory, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, Ann Arbor, Michigan 48109-2143, U.S.A.*; Bram van Leer. *Department of Aerospace Engineering, University of Michigan, Ann Arbor, Michigan 48109-2140, U.S.A.*

A numerical solution has been found for the hyperbolic initial-value problem, which follows from the 16-moment set of equations describing the transport of a plasma in a strong magnetic field. In addition to the time-dependent evolution of mass and momentum, these equations describe the variations in anisotropic temperatures and heat fluxes for both ion and electron species. The numerical solution employs a high-order Godunov method to achieve third-order accuracy in space and second-order accuracy in time. The method includes an approximate Riemann solver which is suitable for a system of equations that cannot entirely be expressed in conservation form. In addition, a new technique has been developed to overcome the stiffness that occurs in regions where plasma flows are strongly reactive. Simple test cases showing correct wave behavior are presented.

OPTIMAL SMOOTHING IN FUNCTION-TRANSPORT PARTICLE METHODS FOR DIFFUSION PROBLEMS. Aaron L. Fogelson and Robert H. Dillon. *Department of Mathematics, University of Utah, Salt Lake City, Utah 84112, U.S.A.*

We discuss a class of particle methods for diffusion problems with small diffusivity, in which diffusion is modeled by random walk update of the particle positions; each particle carries a point-value of the problem's initial data; and the numerical solution is obtained as a discrete convolution of the particle data with an approximate δ-function. While it is widely believed that such a particle method fails to converge, we prove that if the number of particles M and the degree of smoothing, measured by the width ε of the approximate δ-function, are *coupled* so that $(M\varepsilon)^{-1} \to 0$ as $M \to \infty$ and $\varepsilon \to 0$, then the computed solution $u^{\varepsilon}_{M}(x, t)$ converges to the solution $v(x, t)$ of the diffusion equation in the sense that $E(|u^{\varepsilon}_{M}(x, t) - v(x, t)|^2) \to 0$. We also present numerical results which illustrate the theory, and, in particular, show that the method performs uniformly well in the limit that the diffusion coefficient vanishes.

NOTE TO APPEAR

CRYSTAL FIELD ENERGY LEVELS AND STATE VECTORS FOR THE $3d^N$ IONS AT ORTHORHOMBIC OR HIGHER SYMMETRY SITES. Y. Y. Yeung. *Department of Applied Physics, Hong Kong Polytechnic, Hunghom, Hong Kong*; C. Rudowicz. *Department of Applied Science, City Polytechnic of Hong Kong, Kowloon, Hong Kong.*

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