

ON THE NUMERICAL APPROXIMATION TO THE (ENTROPY) SOLUTION OF THE RELATIVISTIC HEAT EQUATION

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In this talk we shall analyze some conservative and non conservative finite difference schemes for the approximation of the relativistic heat equation. We will show the stability of the schemes in conservation form under a Courant-Friedrichs-Lewy time step restriction. In addition we will show a discrete maximum principle in one and two spatial dimensions. A semi-implicit Crank-Nicolson scheme can be formulated to relax the CFL restriction. A set of numerical tests using different initial data will be presented to show the robustness and accuracy of the schemes and their high order accurate versions. We have observed that jump discontinuities are resolved sharp and propagate at the correct speed. We will exhibit continuous initial data that develops jump discontinuities in finite time. A toy model for radiation hydrodynamics in the relativistic diffusion limit will be also examined.

This research work is dedicated to the memory of Fuensanta Andreu. She called my attention to this interesting relativistic heat equation where she contributed with important and difficult existence and uniqueness results.