Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Efficiency of the Sophisticated DSMC Algorithm M.A. GALLIS, J.R. TORCZYNSKI, Sandia National Laboratories — Bird's sophisticated 2007 algorithm (DSMC07) is implemented in a two-dimensional Direct Simulation Monte Carlo (DSMC) code and compared to the standard 1994 algorithm (DSMC94) for multi-dimensional real-world rarefied-gas problems. Two test cases are examined. The first test case involves a typical DSMC problem, hypersonic flow over a wedge. The goal of this test case is to compare the algorithms when the same simulation parameters are used. The second test case involves a systematic analysis of the relative performance of the two algorithms for a real-world microsystem application that is out of reach for most DSMC codes. These comparisons confirm that when the discretization error tends to zero, both DSMC94 and DSMC07 produce results of the same accuracy. However, the two methods have a marked difference in their run times. For these cases, DSMC07 simulates 2-3 times as much physical time per processor-hour as DSMC94 at the same accuracy. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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Date submitted: 11 Jun 2008 Electronic form version 1.4