

# Thermal Lattice Boltzmann models derived by Gauss quadrature using the spherical coordinate system

Victor Eugen Ambrus<sup>1,\*</sup> and Victor Sofonea<sup>2</sup>

<sup>1</sup> Department of Physics, West University of Timișoara, Bd. Vasile Pârvan 4, RO - 300233 Timișoara, Romania

<sup>2</sup> Center for Fundamental and Advanced Technical Research, Romanian Academy, Bd. Mihai Viteazul 24, RO - 300223 Timișoara, Romania

E-mail: victor.ambrus@gmail.com, sofonea@acad-tim.tm.edu.ro

## **Abstract.**

A hierarchy of thermal Lattice Boltzmann models is derived by separation of variables using the spherical coordinate system in the momentum space. The moments of the equilibrium distribution function are computed by means of Gauss-Legendre and Gauss-Laguerre quadratures. This procedure allows us to find the discrete momentum vectors for each model in the hierarchy. The Shakov collision term is used to get the right value of the Prandtl number. Computer simulation of Couette flow is used to illustrate the capability of these models to capture specific effects in microfluidics.