SOLVING THE LINE SHAPE PROBLEM WITH SPEED-DEPENDENT BROADENING AND DICKE NARROWING

D. A. SHAPIRO, *Institute of Automation and Electrometry, Siberian Branch, Russian Academy of Sciences, Novosibirsk 630090, Russia*; R. JAWORSKI, *Institute of Physics, Nicholas Copernicus University, Grudziądzka 5/7, 87–100 Toruń, Poland*; R. CIURYLO and A. D. MAY, *Department of Physics, University of Toronto, ON M5S 1A7, Canada*.

Shapes of pressure and Doppler broadened spectral lines are obtained by solving exactly a 3-dimension transport/relaxation equation. The speed-dependence of collisional broadening and shifting caused by dephasing collisions and Dicke narrowing caused by velocity changing collisions are taken into account. The Rautian-Sobelman and Kielson-Storer model have been used to describe velocity changing collisions. We have shown in the high density or hydrodynamic limit that both models lead to a profile which is the weighted sum of Lorentz profiles if the collisional broadening is much greater than the frequency of velocity changing collisions and to the ordinary Lorentz profile in the opposite case. This shows that the relative size of the optical and kinetic cross-section is important in determining the shape of absorption curves.