Publ. Obs. Astron. Belgrade No. 50 (1995), 15 *Invited lecture*

QUANTUM MECHANICAL CALCULATIONS OF SELF-BROADENING IN RARE GASES

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Full quantum-mechanical calculations of the self-broadening of non-resonant lines in the spectra of helium and neon will be discussed and the results compared with recent experimental data. The calculations are based on the use of accurate interatomic potentials and on the impact theory of Baranger. The Born-Oppenheimer approximation is made in setting up the quantum-mechanical scattering equations and is shown to be valid for the conditions of interest here, namely temperatures in the range 77K to 273K. The equations are then integrated numerically using an R-matrix method which has proved to be very suitable for this purpose since it has the advantage that once the R-matrices have been set up, results for a large number of different incident velocities can be obtained at little extra cost. Thus an accurate average over the Maxwell distribution can be carried out; this is very important when making detailed comparisons with experiment as the use of a single mean velocity in itself leads to significent error.