Third-order many-body perturbation theory calculations for low-lying states in beryllium[1] HUNG-CHEUK HO, W.R. JOHNSON, S.A. BLUNDELL[2], University of Notre Dame — A detailed breakdown of many-body perturbation theory (MBPT) contributions through third order is presented for energies of the ten $(2l\,2l')$ states of beryllium. A total of 84 one-body and 578 two-body terms contribute to the third-order energy. Third-order MBPT calculations for monovalent atoms were carried out fifteen years ago by Blundell *et al.*[1] Second-order calculations for ions of the berylliumlike isoelectronic sequence were also reported six years later[2]. In that paper, only 4 one-body and 20 two-body terms contribute to the second-order energy of neutral Be. The agreement with experimental energies was at 5% level. Our study aims to present complete third-order MBPT formulas, and apply them to the simplest two-valence particles system beryllium to improve the agreement with experiment.

[1] S.A. Blundell, W.R. Johnson and J. Sapirstein, Phys. Rev. A **42**, 3751 (1990).
[2] M.S. Safronova, W.R. Johnson and U.I. Safronova, Phys. Rev. A **53**, 4036 (1996).

W.R. Johnson
University of Notre Dame

Date submitted: 28 Jan 2005

Electronic form version 1.4