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**Perturbative calculation of BEC energies and wave functions in an anisotropic trap with tunable interaction: beyond the mean field and beyond zeroth order** W. BLAKE LAING, MARTIN DUNN, DEBORAH K. WATSON, The University of Oklahoma — In this poster we report progress in pushing our beyond-mean-field perturbative calculation of Bose-Einstein condensate (BEC) ground state energies and wave functions to the first order in the wave function series and the second order in the energy series. We use dimensional scaling, group theory and graph theory to include the effect of every two-body interaction with little computation. This approach is mostly analytic and well-suited for the study of a BEC with tunable interactions, requiring no assumptions concerning the strength or the form of atomic interactions or concerning the number of atoms.

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