The ground and resonant states of three self-gravitating bosons and fermions\footnote{This work is financially sponsored by NSC of Taiwan, ROC.} YEW KAM EUGENE HO, SABYASACHI KAR, Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan — Recently, a new property of the Bose-Einstein condensates (BECs) has been proposed \cite{1} that it is self bound for sufficiently strong self-gravitation, opening up a door to study self-gravitating systems with attractive $1/r$ potentials. Such an attractive potential can simulate gravity between the quantum systems. In the usual strong anisotropy regime, the inter-atomic potential takes a form of $-u/r$, where $u$ is the coupling constant dependent on the laser intensity. Recently, we have investigated the ground state, excited states, and resonance states for three self-gravitating bosons and fermions using highly correlated exponential basis functions \cite{2}. Our calculated bound states energies are lower than the earlier results in the literature \cite{3}. We have also employed the complex-coordinate rotation method \cite{4} to calculate the energies and widths for resonances lying below the $N=2$ and $N=3$ thresholds of the two-body subsystems \cite{2}. \cite{1} D. O’Dell et al., Phys. Rev. Lett. 84, 5687 (2000); Phys. Rev. A 63, 031603 (2001). \cite{2} S. Kar and Y. K. Ho, Phys. Rev. A 76, 032711(2007); Phys. Lett.A370, 306 (2007) ; to be published. \cite{3} J. P. D’Incao et al., Phys. Rev. A 75, 032503 (2007). \cite{4} Y. K. Ho, Phys. Reports 99, 1 (1983).

Y. K. Ho
Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan

Date submitted: 23 Jan 2008

Electronic form version 1.4