Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

On certain electromagnetic field-induced interatomic interactions

J.F. BABB, ITAMP, Harvard-Smithsonian — The long-range retarded dispersion interaction potential between two neutral isotropic polarizable systems is attractive with the characteristic Casimir-Polder form $\sim -23\alpha_1\alpha_2/R^7$, where α_i is the static electric dipole polarizability of a particle and R is the intersystem separation. In contrast, the long-range retarded interaction between an electron and an ion is repulsive with form $11\alpha/R^5$, where α is the ion's polarizability. Theoretically, a way to form a stable BEC with attractive $1/R$ interactions was proposed [1]. Using external laser beams the average interatomic potential is $\sim -11(Iq^2/c)\alpha(q)^2/R$, where I is the laser intensity, $\alpha(q)$ the atomic polarizability, and cq is the frequency. The connections between this (under certain conditions) "artificial gravity-like interaction" and more standard long-range dispersion forces are explored. In addition, similarities to "optical binding" are discussed. Supported in part by the NSF.

[1] D. O'Dell, S. Giovanazzi, G. Kurizki, and V. M. Akulin, Phys. Rev. Lett. **84**, 5687 (2000).

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Date submitted: 25 Jan 2010 Electronic form version 1.4