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Full analytical Expressions of the Quantum Mechanical Energy Eigenstates of charged Particles confined in a Penning Trap at non-relativistic Energies. ERIC STEINFELDS, KEITH ANDREW, Western Kentucky University — The storage of a few charged particles at low kinetic energy and at higher energies can be estimated by finding and characterizing the trajectories of charged particles which are classically bound within a Penning trap. However, there is benefit to using quantum mechanics to predict the energy levels and to map out the probability distributions of a few charged particles such as e's and protons which are 'trapped' in a given Penning Trap with particular settings for Bo (magnetic field) and quadrupole 'E'strength ($Vzz_{[qua]}$). We are able to analytically solve the Schrödinger equation which represents the Hamiltonian of a single charged particle confined in a Penning 'device'. Presuming that the $L_{[orbit]}$ and 'longitudinal' kinetic energies are non-relativistic, then the eigenvalues of the possible energies of the single charged particle follows a formula for "QM" integers N and m: $E_{(N,m)} = 2*\hbar/_M*G*(N+1) - m*\hbar*q*Bo/_M$, where $G= sqrt(q^2*Bo^2/4 - M/_2*q*Vzz_{[qua]})$. This work matches the formulation the famous QM text [1]. On the other hand, ref[1] allows B_o but not $Vzz_{[qua]}$.

Bibliography:
[1] L. Landau and E. Lifshitz, "Quantum Mechanics Course of Theoretical Physics", Volume 3-Third Edition, Pergamon Press, 1977.

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