Self-consistent ground state of charged bosons in a magnetic field

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A charged particle in a uniform external magnetic field occupies the lowest Landau level. However if the number of bosons is macroscopic (a condensate), they produce their own magnetic field (magnetization). The effective field in the sample is the sum of these two fields and it is no longer uniform. The single particle ground state (occupied by the condensate) is also changed and it is different from the Landau state. We try to find this self-consistent ground state and the magnetic field of the sample numerically by adding particles one by one to the system. The starting point is the Landau state of a single particle in a uniform field. After each iteration we calculate a magnetic field produced by particles in the sample and make diagonalization for the new field distribution. Finally we expect to obtain a quantum state and the field distribution which shows the Meisner effect.