APR15-2015-000438

Abstract for an Invited Paper
for the APR15 Meeting of
the American Physical Society

Leroy Apker Award Talk: Finite Temperature Casimir Effect for Charged Scalars in a Magnetic Field

KEVIN SELTZER, Washington Univ

We examine the finite temperature Casimir effect for charged scalar fields (both massive and massless) confined between very large, perfectly conducting parallel plates using the zeta function regularization technique. The scalar field satisfies Dirichlet boundary conditions at the plates and a magnetic field perpendicular to the plates is present. We obtain equivalent expressions for the zeta function which are exact to all orders in the magnetic field strength, temperature, scalar field mass and plate distance. We then use the zeta function to calculate the Helmholtz free energy of the scalar field and the Casimir pressure on the plates in the separate cases of high temperature, small plate distance, strong magnetic field and large scalar mass. In all cases, simple analytic expressions of the zeta function, free energy and pressure are obtained, which are very accurate and valid for practically all values of temperature, plate distance, magnetic field and mass.