Self-adjointness and the Casimir effect with charged massive matter fields

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We study the influence of a background uniform magnetic field and boundary conditions on the vacuum of a quantized charged massive matter field confined between two parallel neutral plates. The admissible set of boundary conditions at the plates is determined by the requirement that the operator of one-particle energy be self-adjoint. A generalization of the MIT bag boundary condition is proposed. We show that, in the case of a sufficiently strong magnetic field directed orthogonally to the plates and a large separation of the plates, the Casimir force is repulsive, being independent of the choice of a boundary condition, as well as of the distance between the plates.