

Cloud Shape of Dipolar Fermi Gases

Vladimir Veljić¹, Antun Balaž¹, and Axel Pelster²

¹*Scientific Computing Laboratory, Institute of Physics Belgrade,
University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia*

²*Physics Department and Research center OPTIMAS, Technical University of
Kaiserslautern, 67663 Kaiserslautern, Germany
E-mail: vladimir.veljic@ipb.ac.rs*

In a recent time-of-flight (TOF) expansion experiment for ultracold polarized fermionic erbium atoms it was shown that the Fermi surface has an ellipsoidal shape [1]. It was also observed that the Fermi surface follows a rotation of the dipoles, which is induced by changing the direction of the external magnetic field, keeping the major axis always parallel to the direction of maximal attraction of the dipole-dipole interaction. Here we present a theory for determining the cloud shape in both real and momentum space by extending the work of Ref. [2], where the magnetic field is oriented along one of the harmonic trap axes, to an arbitrary orientation of the magnetic field. In order to analyze the cloud shape within TOF dynamics, we solve analytically the corresponding Boltzmann-Vlasov equation by using a suitable rescaling of the equilibrium distribution [3]. The resulting ordinary differential equations of motion for the scaling parameters are solved numerically in the collisionless regime at zero temperature and turn out to agree with the observations in the Innsbruck experiment [1].

References

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