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**Bloch-Siegert shift in an interacting Bose-Einstein condensate**

JINYI ZHANG, CHRISTOPH EIGEN, RAPHAEL LOPES, SAM GARRATT, DAVID ROUSSO, ROBERT P. SMITH, ZORAN HADZIBABIC, NIR NAVON, Cavendish Laboratory, University of Cambridge — The Bloch-Siegert shift [?] (BSS) is a paradigmatic frequency shift that arises from the nonlinear response of a two-level system (TLS) subjected to strong driving fields. When a TLS is driven by a linearly polarized field, the co-rotating-wave component leads to the famous Rabi oscillations. By contrast the co-rotating-wave component, whose role is usually neglected in a weak driving, leads to a frequency shift of the TLS resonance frequency. This phenomenon is encountered in various areas, from quantum optics to nuclear magnetic resonance.

Here, we investigate the BSS in a box-trapped  $^{87}\text{Rb}$  Bose-Einstein condensate (BEC) driven by a strong oscillating magnetic field gradient [?]. By tuning the chemical potential of the gas, we investigate how the BSS evolves from the ideal shift of the two lowest energy levels of a single particle in a box to the unexplored shift of long-wavelength collective excitations of the interacting BEC.

## References

- [1] F. Bloch and A. Siegert, Phys. Rev. 57, 522 (1940).
- [2] N. Navon, A. L. Gaunt, R. P. Smith and Z. Hadzibabic, Nature 539, 72 (2016).

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