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Clock shifts in the Unitary Bose Gas RICHARD FLETCHER, JAY MAN, RAPHAEL LOPES, NIR NAVON, ROBERT SMITH, ZORAN HADZIBABIC, University of Cambridge — Clock shifts are interaction-induced changes in the transition frequency between atomic spin states. So-called because of their importance as systematic errors in atomic clocks, they reveal details of both the interaction energy within a gas and the particle correlations. In this work, we employ a RF-injection technique to rapidly project a thermal Bose gas into the unitary regime on a timescale much shorter than three-body losses. Working with a two-state system, one of which exhibits strong intrastate interactions, we carry out Ramsey spectroscopy to extract the variation in the clock shift across a Feshbach resonance. Thanks to the relationship between these shifts and particle correlations, we use our measurements to infer the contact as a function of both interaction strength and degeneracy. This quantity plays a central role in the many-body physics of strongly correlated systems, offering a link between few-body and thermodynamic behaviour.

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