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Precision measurement of atom-dimer interaction in a uniform planar Bose gas

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Understanding few-body interactions remains challenging and we are usually limited to systems close to the unitary regime. Cold quantum gases can give rise to samples where isolated atoms coexist with dimers or trimers. Their low temperature allows then to perform high precision spectroscopy of the effects of interactions between the different constituents.
We report on microwave photoassociation in a degenerate gas of rubidium 87 atoms to create weakly bound dimers in their electronic ground level. We determine the complete energy diagram of one hyperfine manifold of the least-bound level, which we accurately reproduce with a simple model. Then, using the density-induced shift of the photoassociation line, we measure the atom-dimer scattering length for two weakly bound states of the molecular potential.

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