Abstract Submitted
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On the Nature of Feshbach Resonances PAUL JULIENNE, NIST — Magnetically tunable Feshbach resonances that have been used in various experiments with cold bosonic and fermionic quantum gases differ widely in their 2-body molecular physics properties. Some resonances tend to be open channel dominated for near-resonance magnetic field tuning spanning a large fraction of the resonance width. Such resonances are well- characterized by a single scattering length for a field- dependent effective potential. Others are closed channel dominated for tuning spanning most of their width, and the scattering length alone provides an inadequate parameterization of near-threshold scattering and bound state properties. Coupled channels calculations of near-threshold bound and scattering properties using a quantitative model [1] of (F=1/2, M=1/2) + (F=1/2, M=-1/2)6Li atomic collisions illustrate these differences well. The results are consistent with the picture in [2]. The 834 G s-wave resonance is strongly open channel dominated, whereas the 543 G s-wave resonance is strongly closed channel dominated. Using formulas in [3], a general criterion for the near-resonance magnetic detuning range of open channel dominance can be stated in terms of the resonance width, the background scattering length, the difference in magnetic moment between open and closed channels, and the reduced mass of the atom pair. [1] M. Bartenstein, et. al., cond-mat/0408673; [2] S. Simonucci, et al., cond-mat/0407600; [3] Goral et al., J. Phys. B 37, 3457 (2004)

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