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Ultracold three-body collisions and their influence on ultracold quantum gases[1]

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In this talk we will discuss general properties of three-body collisions and their influence on ultracold quantum gases in the regime where the interatomic interactions are strongly affected by a Feshbach resonance. We have developed a simple and unifying picture [1] capable of predicting the energy, mass, and scattering length dependence of the three-body collision rates for all systems relevant for current experiments on ultracold quantum gases. As it turns out, this picture reveals that the scattering length dependence of the three-body rates is strongly influenced by so-called Efimov physics [2]. Efimov's original work in nuclear physics was published roughly 35 years ago, but the first experimental evidence was only recently found using ultracold quantum gases [3]. We will discuss conditions favorable for extending such experiments to enable even more definitive observations of Efimov physics. We will also discuss other processes that might be of interest experimentally such as the formation of long-lived weakly bound boson-fermion molecules. We hope that our results will help experimentalists find ways to take advantage of three-body collisions in their experiments and to encourage them to look for manifestations of few-body physics in this interesting regime. [1] J. P. D'Incao and B. D. Esry, Phys. Rev. Lett. **94**, 213201 (2005); physics/0508119. [2] V. Efimov, Phys. Lett. **33**, 563 (1970). [3] T. Kraemer, *et al.*, cond-mat/0512394.

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