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Two- and Three-body dipolar physics: Efimov physics for interacting dipoles JOSE P. D'INCAO, YUJUN WANG, CHRIS H. GREENE, JILA, Department of Physics, University of Colorado at Boulder — We have developed an adiabatic representation for the two- and three-dipole problems and identified key properties of such systems which might have impact on current experiments with ultracold dipolar atomic and molecular gases. On the two-body level we have explored the three dimensional (3D) and quasi-two-dimensional (Q2D) cases and found that the usually broad dipole-dipole resonances in 3D become extremely narrow in Q2D, limiting the prospects of the control of the dipolar interaction. We also propose an energy analytic form for the pseudo potentials for dipoles that can offer an alternative way to explore the many-body behavior of dipolar gases. On the three-body level, we have found that the effect of the dipolar interactions is quite beneficial to the study of Efimov physics. For dipolar systems, the Efimov physics becomes universal in the sense that it only depends on the two-body physics and besides that the Efimov states tend to be have longer lifetimes as the dipolar interaction becomes increasingly stronger. This work was supported by the US-AFOSR-MURI and NSF.

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