RYDBERG OPTICAL FESHBACH RESONANCES IN COLD GASES

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In this work, we present a novel scheme to efficiently tune the scattering length of two colliding ground-state atoms by off-resonantly coupling the scattering-state to an excited Rydberg-molecular state using laser light. For the *s*-wave scattering of two colliding ^{87}Rb atoms, we demonstrate that the effective optical length and pole strength of this Rydberg optical Feshbach resonance can be tuned over several orders of magnitude, while incoherent processes and losses are minimised [1]. Due to the ubiquity of Rydberg molecular states, this technique should be generally applicable to homonuclear atomic pairs, non bi-alkali mixtures, as well as to other atomic mixtures with *s*-wave scattering and p-wave scattering.

[1] N. Sándor, R. González-Férez, P. S. Julienne and G. Pupillo, arXiv:1611.07091