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Optical Feshbach resonances in 171Yb[1] IRIS REICHENBACH, University of New Mexico, PAUL S. JULIENNE, NIST, Gaithersburg, IVAN H. DEUTSCH, University of New Mexico — Feshbach resonances are a central tool in quantum control of many-body atomic systems. While magnetically induced resonances are routinely implemented in many gases of alkali atoms, optical Feshbach resonances have long been elusive owing to the fact that the optical transition is relatively broad and not easily resolved. We show that alkaline-earth-like atoms are much better suited for the implementation of optical Feshbach resonances, due to their very narrow $^1S_0 \rightarrow {}^3P_1$ intercombination transition. We model the optical Feshbach resonance on the example of 171Yb and determine the scattering length for different detunings and temperatures. We include nuclear spin and hyperfine interaction which leads to purely-long range states and the possibility of manipulating nuclear spin coherence for applications in quantum information processing.

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