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Theoretical analysis of the photoassociative spectroscopy of ultracold strontium atoms[1] PHILIPPE PELLEGRINI, ROBIN CÔTÉ, Physics Department, University of Connecticut, THOMAS KILLIAN, Rice University — Photoassociation (PA) of two colliding ultracold atoms in their ground state occurs when a laser field excites resonantly a ro-vibrational bound molecular level of an excited electronic state. By driving the frequency of the PA laser, high-precision spectroscopy of excited molecular states at large internuclear distances can be performed. The accuracy of the PA spectra allows a precise determination of important parameters such as the atomic radiative life time or the s-wave scattering length. Here, we present results on PA spectroscopy of the excited $^1\Sigma_u^+(^1S_0 + ^1P_1)$ potential of the Sr_2 molecule. A full quantum theoretical analysis of the measured PA spectra will be presented. Accurate determination of scattering lengths and atomic radiative lifetime will be shown and the role of relativistic retardation effects at very large internuclear distances will be discussed.

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