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Controlling autoionization in strontium two-electron-excited states[1] ROBERT FIELDS, XINYUE ZHANG, F.BARRY DUNNING, Department of Physics and Astronomy, Rice University, SHUHEI YOSHIDA, JOACHIM BURGDÖRFER, Institute for Theoretical Physics, Vienna University of Technology — One challenge in engineering long-lived two-electron-excited states, i.e., so-called planetary atoms, is autoionization. Autoionization, however, can be suppressed if the outermost electron is placed in a high-n, $n \sim 300 - 600$, high-L state because such states have only a very small overlap with the inner electron, even when this is also excited to a state of relatively high n and hence of relatively long lifetime. Here the L-dependence of the autoionization rate for high-n strontium Rydberg atoms is examined during excitation of the core ion $5s\ ^2S_{1/2}$-$5p\ ^2P_{3/2}$ transition. Measurements in which the angular momentum of the Rydberg electron is controlled using a pulsed electric field show that the autoionization rate decreases rapidly with increasing L and becomes very small for values larger than ~ 20. The data are analyzed with the aid of calculations undertaken using complex scaling.

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