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A combined B-spline R-matrix approach for the study of time-dependent multielectron dynamics in complex atoms.[1] KATHRYN HAMILTON, OLEG ZATSARINNY, KLAUS BARTSCHAT, Drake University — Experiments with ultrafast lasers are becoming increasingly focused on the role of multielectron effects [1] and the capabilities of mid-IR lasers [2], both of which present considerable challenges to current computational methods. A successful time-dependent multielectron approach, therefore, requires two things: a compact, accurate atomic-structure description, and an efficient time-propagation scheme. Given their individual desirable characteristics and common B-spline basis, the time-independent B-spline atomic R-matrix code (BSR) [3] and the R-matrix with time-dependence method (RMT) [4] are natural choices to provide, respectively, the atomic-structure description and propagation scheme for probing time-dependent behaviors in general atomic systems. We present our efforts in combining the two approaches, which we hope will enable the investigation of phenomena such as auto-ionization and spin-orbit dynamics [5] in multielectron systems. [1] T. Mazza et al., Nat. Commun. **6** (2015) 6799. [2] T. Gaumnitz et al., Opt. Express **25** (2017) 27506. [3] O. Zatsarinny, Comput. Phys. Comm. **174** (2006) 143. [4] A. C. Brown et al., Comput. Phys. Comm. (2019) 107062. [5] J. Wragg et al., Phys. Rev. Lett. **123** (2019) 163001.

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