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Searches for new physics with precision spectroscopy of highly charged ions

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Novel clocks using narrow reference transitions in highly charged ions (HCI) can provide unique leverage to detecting new physics, including variations in fundamental constants^{1,2} and violations of Lorentz invariance³. Ultra-precise quantum logic spectroscopy of trapped HCIs has now been demonstrated⁴, opening the door to optical-clock-level accuracy. The variety of highly charged ions available provides new opportunities for experiment⁵. For example, choosing HCI near orbital crossings allows optical transitions with high sensitivity to new physics, and many opportunities to control systematics. I will present recent results of theory and experiment in this direction, with particular focus recently measured structure of Pr^{9+} ⁶.

¹S. Schiller, **Phys. Rev. Lett.** 98, 180801 (2007)

²J. C. Berengut, V. A. Dzuba, V. V. Flambaum, **Phys. Rev. Lett.** 105, 120801 (2010); J. C. Berengut, V. A. Dzuba, V. V. Flambaum, A. Ong, **Phys. Rev. Lett.** 106, 210802 (2011)

³R. Shaniv et al., **Phys. Rev. Lett.** 120, 103202 (2018)

⁴P. Micke *et al.*, **Nature**, doi:10.1038/s41586-020-1959-8 (2020)

⁵M. G. Kozlov, M. S. Safronova, J. R. Crespo López-Urrutia, P. O. Schmidt, **Rev. Mod. Phys.** 90, 045005 (2018)

⁶H. Bekker *et al.*, **Nat. Comm.** 10, 5651 (2019)