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Extracting transition rates from zero-polarizability spectroscopy ZUHRIANDA ZUHRIANDA, MARIANNA S SAFRONOVA, Univ of Delaware, ULYANA I SAFRONOVA, Notre Dame Univ, CHARLES W CLARK, NIST — Accurate knowledge of atomic properties has been critical for the design and interpretation of experiments, quantifying and reducing uncertainties and decoherence, and development of concepts for next-generation experiments and precision measurement techniques. We predict a sequence of magic-zero wavelengths for which ac Stark shift vanishes for the Sr excited $5s5p\,^3P_0$ state, and provide a general roadmap for extracting transition matrix elements using precise frequency measurements. We demonstrate that such measurements can serve as a best global benchmark of the spectroscopic accuracy that is required for the development of high-precision predictive methods. These magic-zero wavelengths are also needed for state-selective atom manipulation for implementation of quantum logic operations. We also identify five magic wavelengths of the $5s^2\ ^1S_0 - 5s5p\ ^3P_0$ Sr clock transition between 350 nm and 500 nm which can also serve as precision benchmarks.

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