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A new approach to calculations of the hyperfine structure with empirically-deduced nuclear and quantum electrodynamic effects JACINDA GINGES, The University of Queensland, ANDREY VOLOTKA, Helmholtz-Institut Jena — Calculations of the magnetic hyperfine structure rely on the input of nuclear properties – nuclear magnetic moments and nuclear magnetization distributions – as well as quantum electrodynamic (QED) radiative corrections for high-accuracy evaluation in heavy atoms. The uncertainties associated with assumed values of these properties limit the accuracy of atomic calculations. We propose a method for removing this dependence by using measurements and calculations of the hyperfine structure for high states. We have demonstrated removal of the nuclear dependence for s, $p_{1/2}$, and $p_{3/2}$ states of Cs, Fr, Ba^+, and Ra^+. Furthermore, we have shown that for s states the dependence on QED effects may also be removed. This method allows the atomic wave functions in the nuclear vicinity to be tested with increased accuracy and is important for atomic parity violation studies.

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