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Distinguishing State-of-the-Art Atomic Structure Calculations with a Measurement of the $3p_{1/2} \rightarrow 2s_{1/2}$ X-Ray Transition in Neonlike Germanium[1] WYATT JOYCE, PETER BEIERSDORFER, UC Berkeley — We measured the $(2s_{1/2}2p^6 3p_{1/2})_{J=1} \rightarrow (2s^2 2p^6)_{J=0}$ line of neonlike germanium, which has been measured in multiple experiments with widely disparate results. Our measurement was performed at an electron beam ion trap using a very high resolution flat-crystal spectrometer. Our experimental setup attained the highest spectral resolving power ($E/\Delta E \approx 5800$) of any such measurement. This resulted in a relative measurement accuracy of 1×10^{-5}. Our new value not only enables us to distinguish among the past measurements, but our value also serves as a benchmark for evaluating two implementations of the many-body perturbation theory (MBPT) used for performing highly accurate theoretical calculations. Earlier work that focused on $n = 2 \rightarrow n = 2$ transitions of neonlike germanium found that the two implementations of MBPT gave divergent results. However, our measurement of the $n = 3 \rightarrow n = 2$ transition is reproduced by both calculations within 10^{-4}, and one calculation even matches the spectroscopic accuracy of 10^{-5}.

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