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Anomalous magnetic moment (AMM) effect on some $2s^2 2p\ ^2P_{3/2}$ lifetimes

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An experimental lifetime of exceptional accuracy [9.573(4)(5) (stat)(sys)] has been reported by Lapierre *et al.* [1] for the $2p\ ^2P_{3/2}$ state of Ar^{13+}. This result is in good agreement with theory [2] when *neglecting* the effect of the anomalous magnetic moment (AMM), namely 9.582(2) ms, whereas the lifetime with the AMM correction is 9.538(2) ms, well outside the experimental error bar.

The theory method used by Tupisyn *et al.* started with the non-relativistic operator for the line strength of the $2p\ ^2P_{1/2}$ - $^2P_{3/2}$ transition and applied relativistic perturbation theory to the calculation of the lifetime as the inverse of the transition probability between these two fine-structure levels.

The General Relativistic Atomic Structure Package (GRASP2K) [3] is different. It relies on a variational method for determining wave functions for the initial and final states and then a matrix element for a transition operator which, in the Gordon form, can determine the lifetime both with and without the AMM correction, using the observed transition energy. Our lifetimes, 9.5804(16) ms and 9.536(16) ms, respectively are in excellent agreement with the Tupystin *et al.* values. In GRASP2K calculations, a check on the accuracy of the wave function is the prediction of the transition energy and this is the basis for our error estimate. Thus the discrepancy with experiment for Ar^{13+} remains unresolved.

Data will be presented for other ions of the isoelectronic sequence. For K^{14+} a measured value [4] is closer to the value *with* the AMM correction but the uncertainty in the experimental lifetime is so large that it includes both values.

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Author: FROESE FISCHER, Charlotte (NIST)

Co-authors: GAIGALAS, Gediminas (Inst. of Theoretical Physics and Astronomy); GRANT, Ian (Applied Maths and Theoretical Physics); RYNKUN, Pavel (Inst. of Theoretical Physics and Astronomy)

Presenter: FROESE FISCHER, Charlotte (NIST)

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