

Abstract Submitted
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Microwave spectroscopy of the positronium $n = 2$ fine structure

DAVID CASSIDY, LOKESH GURUNG, University College London — The first measurements of the Ps fine structure were conducted by Mills, Berko, and Canter 1975. These were followed by Hatamian, Conti and Rich in 1987, and then Hagena and co-workers in 1993. Then nothing happened for 25 years, possibly because the methods used by these authors could not easily be improved. We report here some new measurements of the Ps $2^3S_1 \rightarrow 2^3P_2$ transition frequency performed using new techniques not available to the previous experimenters. With near-thermal Ps emitted from a mesoporous silica film excited 2S atoms were generated via single-photon laser excitation and transitions to 2P levels were driven by microwave radiation. This transfer of long-lived 2S atoms to short lived 2P atoms was observed via the time dependence of annihilation radiation. The theoretical value for this interval is 8626.71 0.08 MHz, and preliminary measurements are in agreement with theory. Because Ps is essentially a pure QED system, precision measurements of its energy levels can be used to search for forbidden transitions, non-commutative space, or new ultralight interactions. Future developments in this area will be discussed.

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