

Laser excitation of 8-eV electronic states in Th^+ : A first pillar of the electronic bridge toward excitation of the Th-229 nucleus

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The possibility to realize a nuclear clock based on laser excitation of the isomeric state in Th-229 [1, 2] has motivated experiments with thorium ions in solids and in ion traps. To facilitate the search for the nuclear transition within a wide uncertainty range about 8 eV, we investigate two-photon excitation in the dense electronic level structure of Th^+ , which enables the nuclear excitation via a resonantly enhanced electronic bridge process [3]. In our experiment, the trapped Th^+ ions are driven on the strong resonance line from the $(6d^27s)J=3/2$ ground state to the $(6d7s7p)J=5/2$ state at 402 nm [4]. Using nanosecond laser pulses in the 250-nm wavelength range for the second step of a two-photon excitation, we have observed several previously unknown levels of Th^+ around 8 eV.

References

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