

Physics/Optics Seminar

Optical Spectroscopy of an Atomic Nucleus: The Thorium-229 Nuclear Clock

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10:00 am

Department of Physics and Astronomy, Room 190

ABSTRACT

Thorium-229 has a nuclear isomer with an exceptionally low excitation energy of 7.6 ± 0.5 eV. This makes it possible, in principle, to observe absorption and emission from an atomic nucleus at optical (vacuum ultraviolet) wavelengths. The lifetime of the isomer state has been estimated at ~ 5 hours and may enable nuclear clocks that have a 10,000 fold higher precision than today's best laboratory standards. GPS, long-baseline interferometry, quantum communication, and precision tests of general relativity and fundamental constants would all greatly benefit from the high precision of a nuclear clock. I will approach this field from the perspective of a material scientist and present the strategies we pursue and the challenges we face in creating a material suited for the first ever optical spectroscopy of an atomic nucleus.

Host: Mansoor Sheik-Bahae