

SCHOOL OF PHYSICS

UNIVERSITY OF NEW SOUTH WALES



COLLOQUIUM

4-5 p.m., Tuesday, 10 March, 2009

School of Physics Common Room

Room 64, Old Main Building

Professor Wayne Itano

National Institute of Standards & Technology (NIST), USA

“Atomic Frequency Standards and Clocks: Recent Developments and Applications to Fundamental Physics”

Atomic frequency standards are oscillators whose frequencies are servo-locked to atomic resonances. Atomic clocks measure intervals of time by counting these stabilized oscillations. The uncertainties of these devices continue to improve and have now reached a level of a few parts in 10^{17} . I will begin with some introductory remarks on the basic principles of atomic clocks and their historical development and then describe more recent developments, which depend on laser cooling, particle trapping, and coherent optical frequency measurements. With the increase in accuracy, effects once considered small, like the frequency shift due to blackbody radiation, are now very important. Practical applications of atomic clocks include advanced navigational techniques, like the GPS system. Scientific applications include searches for time variations of the fundamental constants, such as the fine-structure constant α .

The audience is invited to meet the speaker beforehand at 3.45 p.m. over coffee and biscuits in the Common Room.

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