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ADVENTURES WITH TRAPPED ION ATOMIC CLOCKS : FROM NUCLEAR STRUCTURE TO DEEP SPACE NAVIGATION

MARDI 15 SEPTEMBRE 2026, 18H00

Petit auditoire, bâtiment G Unimail (Avenue de Bellevaux 51)
L’entrée est gratuite. La présentation sera suivi par un apéro.

(The presentation will be given in English)

Conférence organisée par le Laboratoire Temps-Fréquence (LTF) de l’Université de Neuchâtel

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The advent of trapping and cooling of atoms and ions has revolutionized atomic clocks. The resulting unprecedented accuracy and stability has enabled many applications as well as fundamental science. Room-temperature microwave trapped ion atomic clocks are particularly well-suited for autonomous operation in deep space, primarily for deep space navigation applications. Progress on this technology has been in three areas: 1) ultra-stable clocks that can operate autonomously, 2) space clocks, and 3) miniature clocks. In this talk I will focus on the first two applications. Over the years various refinements in this technology, including the linear ion trap, the multi-pole trap, and the compensated multi-pole trap, have led to state-of-the-art continuously operating clock stability. I will first describe this technology and how it was able to achieve its high degree of stability. Next, I will describe how this technology was adapted for operation in space, with the associated constraints on size and robustness and how operation of this technology in space enables a new type of deep space navigation. Finally, I will describe several scientific applications of this technology, including a measurement of the Hyperfine Anomaly in mercury ions, essentially a measure of the size of the nucleus, new ways to place limits on fundamental constant variation, proposals to test general relativity, and ways in which this technology can enable radio science measurements used to better understand planetary atmospheres and gravitational fields.

Eric Burt received a Ph.D. in experimental atomic physics from the University of Washington. Subsequently he held a post-doctoral position at the University of Colorado, working on Bose-Einstein condensates. Since then, his career has been focused on the development of trapped ion and laser-cooled neutral atomic clocks for ground and space applications. He is IEEE distinguished lecturer for Frequency Control 2025/2026

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