



ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 13 February 2014

17:00 -18:00

3rd Floor Seminar Room

“Chip-scale atomic devices: from atomic clocks to brain imaging and beyond”

Dr. John Kitching

National Institute of Standards and Technology, Boulder USA

Abstract

We describe work a NIST to develop precision instruments based on atomic spectroscopy, advanced semiconductor lasers and micro-electro-mechanical systems (MEMS). These millimeter-scale instruments achieve useful levels of stability or sensitivity but with reduced power consumption and potentially reduced manufacturing cost compared to their larger counterparts. Physics packages for atomic frequency references with fractional frequency stabilities in the range of 10^{-11} over one hour have been demonstrated. Using similar device designs and processing, magnetometers with sensitivities below $10 \text{ fT/Hz}^{1/2}$ have been demonstrated, making them competitive with commercial SQUID-based sensors without the need for cryogenic cooling. The design, fabrication and performance of these instruments will be described, as well as a number of applications to which the devices are well-suited.