Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

An Ultra-Cooled Atomic Quantum Sensor for Precision Detection of Oscillating Electric Signals[1] DANIEL RODRIGUEZ, J. BERROCAL, F. DOMINGUEZ, M. J. GUTIERREZ, R. RICA, Departamento de Física Atómica, Molecular y Nuclear, Universidad de Granada, Spain, TRAPSENSOR TEAM — Non-destructive detection of oscillating charges with minute strengths is important for several applications, particularly to perform ultra-accurate mass measurements by means of Penning traps. There are remarkable results obtained using electronic circuits [Nature 506, 467 (2014)], when the trapped charged particle is more than 100 times lighter than a superheavy atom. In this contribution, we will report on a novel concept under commissioned at the University of Granada, to replace the circuit immersed in a liquid-helium tank, by a laser-cooled Ca^+ ion held in an ion trap with rotational symmetry, that should be coupled to another bound particle, following a previous idea published in the nineties [PRA 42, 2977 (1990)]. So far, we have studied the miliKelvin ion reservoir (after Doppler cooling), theoretically and experimentally, in collaboration with the QUTIS group (E. Solano et al.), to obtain the full characterization [arXiv:1612.08577]. We work currently towards applying ground-state cooling to reach the Quantum-limited region of performance, and in parallel, in the completion of a double micro-Penning trap mass spectrometer for ion-ion coupling, which has been built in collaboration with a group at PTB and Uni. Hannover (C. Ospelkaus et al.) [IJMS 410C, 22 (2016)].

[1]Acknowledgement: Projects 278648-TRAPSENSOR (ERC grant), and FPA2015-67694-P (Spanish Government)

Daniel Rodriguez
Universidad de Granada

Date submitted: 20 Mar 2017 Electronic form version 1.4