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Status of the project TRAPSENSOR: a laser-cooled ion as a high-sensitive detector for single-ion Penning trap mass spectrometry

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Penning traps are used at many facilities to perform direct high-precision mass measurements on stable and/or radioactive nuclides. For stable or long-lived nuclides, the developments are going mainly in the direction of improving precision. In the case of very exotic nuclei, an important objective is to enhance sensitivity. This motivates further work on conventional techniques, initially applied to stable isotopes, and to develop new ones. In this scenario, we are developing a novel technique at the University of Granada in the framework of the project TRAPSENSOR. This technique is based on the detection of a single ion stored in a Penning trap by monitoring the fluorescence of a laser-cooled 40Ca^+ ion, which is connected to the ion of interest through electrical image charges these ions induce in a common electrode [1]. An important aim of the project is to perform measurements on ions produced with very low yield as for example superheavy elements [2,3]. The full experimental set-up comprises a laser-desorption ion source [4], a Penning-trap system consisting of a preparation trap and double micro-trap system housed in a 7-T superconducting solenoid, and a high-performance laser arrangement [5]. In this contribution, the status of the project will be presented, underlining technical features with prospects for other experiments, and the results achieved so far.

[1] D. Rodríguez, *Appl. Phys. B Lasers: O.* 107 (2012) 1031

[2] M. Block et al., *Nature* 463 (2010) 785

[3] E. Minaya Ramirez et al., *Science* 337 (2012) 1207

[4] J. M. Cornejo et al., *Nucl. Instrum. Methods B* 317 (2013) 522

[5] J.M. Cornejo, P. Escobedo and D. Rodríguez, *Hyperfine Interact.* 227 (2014) 223

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