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Implementation of the double Penning trap mass spectrometer MLLTRAP at ALTO

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Mass measurements of exotic nuclei with high precision are of big interest for nuclear physics and nuclear astrophysics. They give access to nuclear binding energies permitting to explore nuclear shell structure. They are also entries for nucleosynthesis models and allow discriminating between different models. The principal spectrometers to perform high precision mass measurements are those based on ion traps. MLLTRAP is a double Penning trap mass spectrometer (PTMS) which is located at the ALTO facility (Accélérateur et Tandem à Orsay). At ALTO, it will mainly be dedicated to perform high precision mass measurements of neutron rich exotic nuclei around the shell closures N = 50 and N = 82. These nuclei far from the valley of stability of the nuclear chart have short lifetimes, and sometimes very short-lives isomers. Measuring their properties is a real challenge. The first mass measurements campaign for MLLTRAP will focus on the silver isotopes towards the shell closure N = 82. Neutron rich exotic nuclei are produced by photo-fission at ALTO. The element of interest can be selected using a laser ion source. The ions are accelerated up to a few tens of keV to provide a low energy beam to the experimental setups. Upstream from the PTMS, the low energy beam is transported to a linear segmented Paul trap (RFQCB) where the ions are cooled and bunched. When ejected from the RFQCB, they are decelerated to be injected into the PTMS. The off-line commissioning of the PTMS and the RFQCB will be performed with a high voltage stable ion source developed at Orsay. Alkali metals, 133Cs and 85-87Rb will be produced with the stable ion source and accelerated up to 50 keV in order to caracterize the traps and the transport line in comparable energy conditions to on-line conditions. In order to implement the Phase-Imaging Ion-Cyclotron-Resonance (PI-ICR) technique at MLLTRAP, required to improve the precision of the mass measurements, the current control and detection systems are being upgraded. This technique will, in particular, allow to discriminate between ground and isomeric states of silver isotopes as a high resolution is necessary. Moreover, only a few ions are needed to get mass measurements when using PI-ICR technique. In parallel, a special magnetic probe has been developed and installed in the 7T superconducting magnet. This probe will be used to monitor the magnetic field variations in real time during the mass measurements experiments. In this contribution, the progress of the implementation of the different sections, the first off-line results and the schedule for the first on-line measurements will be presented.

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