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MUSETT and the spectroscopy of heavy elements at GANIL

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Ch. THEISEN for the MUSETT collaboration

In the last few years, an impressive amount of new information has been obtained in the region of the heaviest elements. Detailed information has been obtained on the collective properties and single-particle structure using both prompt and decay spectroscopy techniques.

However, very little data are available for nuclei located on the less neutron-deficient side of this region of the nuclear chart. Indeed, these isotopes can only be populated in very-asymmetric hot fusion-evaporations reactions using light-ion beams and actinide targets with the consequence that the recoiling nuclei have a very large angular distribution and a very low kinetic energy. The transmission of separators or spectrometers is usually poor for such reactions. With its very large acceptance providing a high transmission, VAMOS is well adapted to these studies; recoils are detected in the new MUSETT silicon detector array ("Mur de Silicium pour l'Etude des Transfermiens par Tagging"), which has been developed for the detection of the very heavy and very slow fusion-evaporation residues and for alpha-decay tagging. MUSETT is made of 4 segmented double-sided silicon detectors (128 strips on each side) assembled in a wall having a total size of 40x10 cm2 covering the VAMOS focal plane. Given the very large number of strips a new highly integrated ASIC based electronics and data acquisition system have been developed. Recoil-decay tagging will be used to unambiguously identify evaporation residues in the dominant backgrounds of unwanted reaction channels, while EXOGAM will provide a large efficiency for the detection of prompt gamma-ray cascades.

In this contribution, we will first give an overview of our experimental program on transfermium and trans-actinides elements studies. We will then describe the new MUSETT silicon wall and show the results of the first commissioning experiment. A new gas-filled operation mode has been recently implemented at VAMOS, which extends the capability of the spectrometer in symmetric and inverse kinematics fusion-evaporation reactions. Examples of nuclear structure and reaction dynamics studies using this new mode and MUSETT will be given. In a near future the Super Separator Spectrometer S3 and the ultra-high intensities of the LINAG linear accelerator will provide fantastic opportunities for decay-spectroscopy studies. We will show how the S3 focal plane detection will benefit from the MUSETT developments and give examples of first-day experiments foreseen with S3 in 2013.

Is this an invited talk? (please answer yes or no)

no

Would you prefer your contribution to be a poster presentation? (please answer yes or no)

no

Would you prefer your contribution to be an oral presentation? (please answer yes or no)

yes

Are you a student, postdoc or an attendee from an "emerging"country and would like to apply for financial support?

no

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