## **PHENIICS Fest 2017**



ID de Contribution: 25 Type: Talk

## First life time measurements in the <sup>78</sup>Ni region with AGATA and VAMOS at GANIL

mardi 30 mai 2017 18:05 (15 minutes)

Yrast (\textit{i.e.}\ the state with the lower energy for a given spin-partiy) and near-Yrast states were populated in the  $^{78}$ Ni region by fusion-fission reaction  $^{238}$ U( $^{9}$ Be,X $\gamma$ ) at GANIL. The prompt  $\gamma$ -rays were detected by the AGATA array\footnote{S. Akkoyun \textit{et al.}}, \textit{AGATA - Advanced GAmma Tracking Array}, NIM A668 (2012) 26-58} and particle identification was achieved

using the VAMOS++ spectrometer\footnote{M. Rejmund \textit{et al.}, \textit{Performance of the improved larger acceptance spectrometer: VAMOS++}, NIM A646 (2011) 184-191}. Life time measurements were performed using the Recoil Distance Doppler Shift technique developed at Cologne\footnote{J. Litzinger \textit{et al.}, \textit{Transition probabilities in neutron-rich  $^{84,86}$ Se}, Phys. Rev. C 92, 064322 (2015)} with the Orsay plunger device OUPS\footnote{J. Ljungvall \textit{et al.}, \textit{The Orsay Universal Plunger System}, NIM A679 (2012) 61-66}.

The goal of the experiment was to populate Yrast states in N=51 neutron-rich odd-isotones from  $^{89}$ Sr (Z=38) down to  $^{83}$ Ge (Z=32) in order to study the high- $\ell$  single-particle states effective energy evolution above the N=50 shell gap and complement the scarce direct nucleon exchange data presently available\footnote\{J.S. Thomas \textit\{et al.}\}, \textit\{Single-neutron excitations in neutron-rich  $^{83}$ Ge and  $^{85}$ Se\}, Phys. Rev. c 76, 044302 (2007)\}. These reactions are indeed difficult to exploit with presently available post-accelerated radioactive ion beams (especially for high- $\ell$  orbitals) in this exotic region. More specifically, we have focused our attention on the  $\nu 1g_{7/2}$  monopole drift which is key to understanding the possible evolution of the spin-orbit splitting due to the action of the proton-neutron interaction terms in the  $^{78}$ Ni region. Our strategy was to measure low lying  $7/2^+$  states life times as their relative change along the N=51 line towards Z=28 should reflect their possible  $\nu 1g_{7/2}$  composition. The tensor mechanism\footnote\{T. Otsuka \textit\{et al.}\}, \textit\{Evolution of nuclear shells due to the tensor force\}, Phys. Rev. Lett. 95, 232502 (2005)\} indeed predicts increasing low-lying  $\nu 1g_{7/2}$  single particle components in the wavefunctions approaching  $^{79}$ Ni.

In this talk, the particle identification and the life time measurement method will be presented with some examples.

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Classification de Session: Nuclear physics - experimental