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Structure beyond the N=50 shell closure in neutron-rich nuclei in the vicinity of 78Ni: The case of N=51 nuclei

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Recent experimental discoveries have revealed that the neutron effective single-particle evolution above 78Ni (N>50) shows peculiar or unpredicted behaviours. The aim of this work is to determine the nature of the low-lying yrast or quasi yrast 7/2+ and 9/2+ states in 32 < Z < 40, odd-neutron N=51 nuclei, in order to assess their "collective" (core-particle coupled) or υ1g7/2 and υ(2d5/2)2(1g9/2)-1 single-particle origin and better constrain the relative position of the neutron single-particle states above a 78Ni core. Calculations show that there is a difference of about two orders of magnitude between core-particle coupled state and single-particle state half-lives.
A Recoil distance Doppler-shift (RDDS) experiment has been performed at LNL (Italy). The neutron-rich nuclei were produced via deep-inelastic, multi-nucleon transfer and induced fission reactions with the 82Se(@ 505 MeV) + 238U system. The setup combined the AGATA demonstrator composed of 5 triple clusters, the PRISMA fragment spectrometer and the Cologne plunger. The number of plunger distances was restricted to only two. This allowed to maximize the statistics for each degrader position while being able to provide the half-live domain (< 1 ps or several tens ps) of the states of interest, which was sufficient for the main goal of the experiment. This strategy proved to be fruitful, as will be shown in this presentation which gives half-lives results of the lowest-lying 7/2 and 9/2 states of two N=51 nuclei, 87Kr and 85Se, as well as indications of higher lying state half-lives up to spin 19/2- in 87Kr.

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