Intermediate energy Coulomb excitation of ^{73,74,75}Ni

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Doubly magic nuclei located in very exotic regions of the nuclear chart are key elements in nuclear structure studies. The appearance or disappearance of the shell gaps associated with magic numbers in very exotic nuclei is strongly related to the single-particle energies of nucleon orbitals and to the residual interactions among valence nucleons. The ^{100}Sn and ^{78}Ni regions are fundamental in this regard and are the focus of the efforts of many research laboratories worldwide. From the N=Z=50 ^{100}Sn located at the proton drip line to the neutron rich N=50 ^{78}Ni with N/Z=1.78, it is currently possible to access the shell structure of these isotones. This very large excursion in isospin also allows to magnify and probe the isovector part of the nuclear mean field. In particular, the tensor part of the spin-isospin term of the residual interaction has been predicted to modify the single-particle structure, inducing a collective behavior in this region. For the Ni isotopic chain, the filling up of the $g_{9/2}$ neutron orbit is expected to induce a strong core polarization due to the spin-isospin interaction that enhances the B(E2:$2^+ \rightarrow 0^+$), a measure of the quadrupole collectivity. We performed an intermediate energy Coulomb excitation study of the ^{73,74,75}Ni isotopes, in order to fix the seniority-scheme pattern of the B(E2) strength. Neutron-rich Ni isotopes were produced by fission of a ^{238}U beam on a ^{9}Be target at a bombarding energy of 345 MeV/u, with an average intensity of 10 pnA. The resulting fragments were analyzed using the BigRIPS separator[2)] and transported to a secondary natural Pb target for Coulex reactions. After this target, the ions were again analyzed in the ZeroDegree spectrometer and delivered down to the final focal plane. The γ rays from Coulex have been detected by the DALI2 spectrometer[3)] in coincidence with the recoiling ions identified at the focal plane of the ZeroDegree spectrometer. A preliminary γ spectrum, after selection on ^{74}Ni ions, is shown in Fig. 1. The γ peak corresponding to the $2^+ \rightarrow 0^+$ de-excitation at 1024 keV of ^{74}Ni[4,5)] is clearly visible. Decay spectroscopy investigation[6)] with EURICA was performed at the final focal plane in conjunction with the in-beam part.

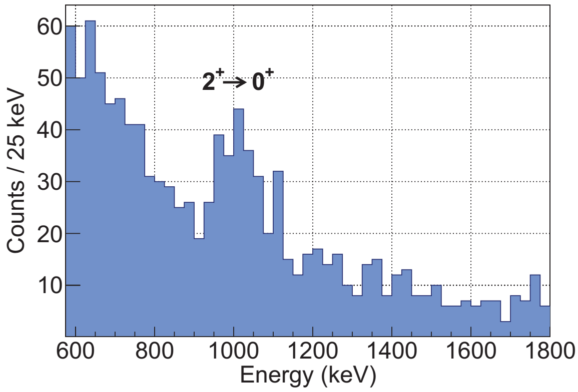

Fig. 1. The γ-ray spectrum detected in DALI2 after selection on ^{74}Ni. The $2^+ \rightarrow 0^+$ transition at 1024 keV is clearly visible.

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