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Fission fragment spectroscopy of isotopically identified neutron rich nuclei

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The single-particle excitations, particle-hole interactions, and mixing of various single particle configurations in nuclei with few valence particles or holes around ^{132}Sn have been the subject of contemporary interest, both experimentally [1–4] and theoretically [5]. The excited states of these neutron-rich nuclei provide key inputs to understand the effective interactions in terms of large scale shell model calculations. Presence of high-j unique parity orbitals plays a major role in generating high spin states in these nuclei and is also responsible for occurrence of isomers in odd-A as well as in odd-odd nuclei in this region.

The neutron-rich nuclei with few valence particle / holes in Z=50, N=82 closed shell are only accessible via fission and direct identification of the nuclei with both mass (A) and charge (Z) selection is extremely challenging. Neutron-rich nuclei around ^{132}Sn have been investigated using fission reaction of ^{238}U beam of 6.2 Mev/u impinging on ^{9}Be target at GANIL [6]. The isotopic identification (A, Z) of the fission fragments was obtained using the large acceptance magnetic spectrometer VAMOS++. The prompt γ rays emitted from the recoiling fission products at the target position were detected using γ-ray tracking array AGATA and the EXOGAM segmented clover detectors were placed behind the focal plane of VAMOS++ to detect the delayed γ rays. Some of the complimentary studies on low lying states have also been carried out from decay spectroscopy after α induced fission at VECC, Kolkata.

The high spin states of neutron rich Iodine nuclei above the long lived isomers are populated for the first time and new isomers are also identified from prompt-delayed spectroscopy [7]. The level structures are interpreted in terms of the systematics of odd-Z nuclei above the Z = 50 shell closure and large-scale shell model calculations.

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