Thesis abstract of Mr Praveen Muralidhar JODIDAR

"Study of collectivity in neutron-deficient A≈120 nuclei close to the proton drip line"

This thesis reports on spectroscopic studies of very neutron-deficient nuclei in the mass region A≈120. We performed the fusion evaporation reaction ^{64}Zn+^{58}Ni and used the Jurogam 3 + MARA setup located at JYFL, Finland. More than 15 nuclei were produced in this reaction. Our study was mainly focused on three isotopes : ^{120}La, ^{117}Cs, and ^{114}I.

We identified excited states in ^{120}La for the first time which makes ^{120}La the lightest isotope of lanthanum known spectroscopically. The observed states are organized in a cascade built on the ground state and a rotational band built on the $\pi h_{11/2} \otimes \nu h_{11/2}$ configuration. Cranked Nilsson Strutinsky calculations were performed to estimate the deformation parameters, and a two-quasiparticle plus triaxial rotor model was employed to describe the signature inversion and B(M1)/B(E2) transition probabilities.

In the case of ^{117}Cs, we found three new bands, established the ground state, and the excitation energies of bands 1 and 2. With the help of the mass spectra obtained at the focal plane of the MARA separator and the X-rays observed in the Jurogam 3 detector, we firmly assigned all the observed bands to ^{117}Cs. Particle number conserving cranked shell model calculations were performed to check the assigned configurations to all bands. The calculations suggest that ^{117}Cs is a deformed nucleus with ϵ_2≈0.32.

We also studied the level structure of ^{114}I, in which we found several low-lying states characterized by a small deformation, and three rotational bands at higher excitation energy based on larger deformation. We established the bandhead energy of all bands and thereby identified the ground state. Three new isomers were identified based on the imbalance in the intensities. The shell-model calculations suggest a prolate-oblate shape coexistence in ^{114}I.

In all this work, spins and parities were assigned based on angular correlation and polarisation measurements. We also performed a detailed analysis of the rotational properties of all identified bands, which helped us to understand the physics behind the level structure.