2 - 1 Research Progress of Nuclear Structure Research Group

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The Group of Nuclear Structure Research at IMP has been working in the field of high-spin level structures via standard in-beam γ-ray spectrum. In order to explore the new high-spin physics in nuclei far from the valley of stability, we have recently completed the construction of a large-scale γ-ray detection array. This array consists of 15 HPGe, 9 Clover and 8 $LaBr_3$ detectors, providing excellent energy and timing resolution and high full-energy peak efficiency.

The first experiment was performed in 2017 at the TL2 beam line of HIRFL in Institute of Modern Physics, Chinese Academy of Sciences. High-spin states of ^{95}Tc have been populated by the ^{90}Zr (^{12}C, αp2n) fusion-evaporation reaction. The beam was delivered from the SFC. 15 HPGe, 7 Clover and 3 $LaBr_3$ detectors were available during the experiment. The use of Clover detectors facilitate the linear polarization measurement of γ ray[1,2], together with the angular distribution information, to firmly determine the level spin and parity. According to the measured γ rays, we have constructed a new level scheme for ^{95}Tc, which differs from the previous result[3] mainly by the level spins and parities for the Clover detectors added into the array.

In addition, we have performed another in-beam γ-ray experiment in INFN, Italy. The experiment aimed at the high-spin level structure of ^{130}Ba via the ^{122}Sn (^{13}C, 5n) fusion-evaporation reaction. The emitted γ rays, charged particles and neutrons were detected during the experiment. According to the particle-γ and $\gamma-\gamma$ coincidences as well as the angular distribution information, we have constructed a level scheme built up from the long-lived 8^- isomer in ^{130}Ba[4].

References

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2 - 2 Structure above *K*-isomer in ^{130}Ba

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Isomeric I^π=8^- states have been observed in the even-even $N = 74$ nuclei ^{138}Gd[1], ^{136}Sm[2], ^{134}Nd[3], ^{132}Ce[4], ^{130}Ba[5], ^{128}Xe[6] with half-lives ranging from nanoseconds (Xe) to milliseconds (Ba, Ce). Rotational bands built on the K^π=8^- isomer were identified in all these isotones, with the exception of ^{130}Ba. The single-particle configuration of the isomers have been deduced from the $\Delta I = 2$ to $\Delta I = 1$ γ-ray intensity branching ratios, which allowed to extract the $(g_K - g_R)/Q_0$ values, and therefore the quasi-particle configuration of the state. A predominant ν $9/2^-[514]\otimes\nu$ $7/2^+[404]$ two-quasineutron structure has been deduced for the isomers with observed bands built on them. As Z increases across the $N = 74$ nuclei from ^{128}Xe to ^{138}Gd, the decreasing energy of the first excited 2^+ state indicates that the deformation increases. It might therefore be expected that the K-selection rule governing the E1

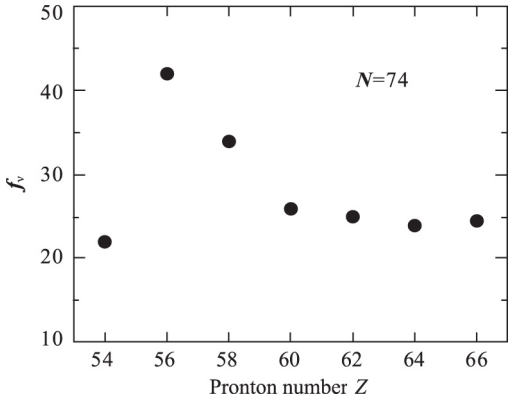

Fig. 1 The hindrance per degree of K forbiddenness f_ν for the transitions from the K^π=8^- state to the 8^+ member of the yrast band in the $N = 74$ isotones.