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## Gamma spectroscopy of neutron-rich Y isotopes: Identification of new multi-quasiparticle isomers

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For the neutron number  $N = 60$ , a sudden onset of the deformation has been observed in Y isotopes at the ground state, which is manifested by the presence of rotational bands (e.g. [1]). On the other hand, the occurrence of shape coexistence in nuclei with  $N = 58$  and  $59$ , in this region (e.g. [2]), suggests that the evolution of the deformation is a more gradual process. Our recent research has shown that already in the  $N = 57$ ,  $^{96}\text{Y}$  isotope the coexistence of spherical and deformed structures is present and a rotational band is built on the top of a new  $(6^+)$ , 181-ns isomer [3]. In the current analysis, we focused on the neutron-rich Y isotopes with  $N \geq 60$ , in which the deformed structures are firmly established. For  $N = 60$ , i.e., in  $^{99}\text{Y}$ , in addition to the ground state rotational band, two other bands could be found above  $11/2^+$  (1.6 ns) and  $17/2^+$  (8  $\mu\text{s}$ ) isomers [4]. These isomers have been interpreted as three-quasiparticle states with  $\pi 5/2[422]v3/2[411]v9/2[404]$  configuration. Our goal is to search for similar isomers with relatively high-spin in Y isotopes beyond  $N = 60$  boundary.

The neutron-rich  $^{100}\text{Y}$  and  $^{101}\text{Y}$  isotopes have been produced in the fission of  $^{235}\text{U}$  active target [5] induced by thermal neutrons from the reactor at Institut Laue-Langevin. The level scheme up to excitation energy of 2.5 MeV has been established based on multi-fold gamma-ray coincidence relationships measured with the new, highly-efficient HPGe array FIPPS [6]. Additionally, the low-spin structures in  $^{101}\text{Y}$  have been examined using dedicated measurement where fission products were separated by the LOHENGRIN spectrometer.

By exploiting delayed- and cross-coincidence techniques [7], the extensive structures have been delineated. During the analysis, over 20 new gamma transitions, which feed previously known low-spin states, have been identified. Moreover, new isomeric states at higher excitation energy have been located. By using the delayed-coincidence method, it was possible to identify the structures above the isomers confirming their rotational characters. As in the case of  $^{99}\text{Y}$  isotope, the isomeric states could be interpreted as multi-quasiparticle type. The configurations of the new bandheads will be discussed based on the observed decay patterns, as well as Hartree-Fock-Bogoliubov calculations.

Existence of isomers in the  $^{100}\text{Y}$  and  $^{101}\text{Y}$  isotopes which are bandheads of rotational structures provides new information about deformation in neutron-rich nuclei around  $A = 100$ . It should be emphasized that this is in contrast with other isotopic chains with  $N > 60$  and  $Z = 38-44$ , where the bandheads of the higher-located rotational structures are not isomeric.

### References:

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