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The 49/2+ Isomer in 147Gd –Study of the most complex isomeric decay

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The LINAC-ALPI accelerator at LNL and the GASP array were used to perform gamma spectroscopy experiment aimed at two separate goals. The first one was to test the possibility to observe the Coulomb excitation of 147Gd states located above the 49/2 isomer in a secondary scattering of reaction products in the 208Pb catcher. The second goal was to clarify the gamma branching in the earlier studied isomeric decay. The 76Ge+ 290 MeV 76Ge fusion evaporation reaction produced abundantly the 147Gd high-spin isomeric state and the collected gamma coincidence data were analysed taking into account both aims of the experiment.
A brief summary of the analysis concerning the Coulomb excitation test will be followed by an extended presentation of results obtained in the study of the 147Gd isomer decay. The gamma coincidence analysis revealed in this decay more than 300 gamma transitions with intensities down to about 10-4 per decay level. All of them were safely placed in the level scheme, which in some parts had to be substantially modified compared to previous results [1,2]. A nearly perfect intensity balance observed at all populated levels indicated the completeness of the presently established decay scheme and fully confirmed the earlier anticipated complexity of the gamma branching. The intensity balance allowed to extract total electron conversion coefficients for many low energy transitions which uniquely characterized their multipolarity. Together with the earlier measured angular distribution coefficients [1,2] and electron conversion results [2], spin and parity values could be unambiguously assigned to nearly all of the populated levels. The 49/2+ assignment [2] of the isomer was confirmed and assignments of all populated levels revealed the decay paths through yrast and many non-yrast states.
The studied decay presents the most complex isomeric decay known today in the whole chart of nuclides.

1. R. Broda et al. Z.Phys.A305, 281 (1982)
2. O. Bakander et al. Nucl.Phys.A389, 93 (1982)

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