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Spectroscopic studies in $^{152-154}$Gd

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Fusion-evaporation reactions have been proven very successful in populating excited states of deformed nuclei. The rare-earth region has been the focus of various studies (using Coulex etc) aiming at the understanding of nuclear structure and providing information on the details of the reaction mechanism. The Gd isotopes belong to this group of nuclei and despite the available spectroscopic information, several open questions about their structure still exist, such as the interband transitions related to shape evolution or branching ratios in deformed states. In addition, production cross-sections of different reactions on Gd isotopes are largely unknown. In this work, we report on an experimental attempt to populate the excited states in the isotopes $^{152-154}$Gd, by employing the 2n transfer reaction ^{138}Ba(^{18}O, ^{16}O)^{140}Ba and the subsequent fusion reaction ^{18}O + ^{138}Ba in the energy range of 61-67 MeV. The experiment was conducted at the 9 MV FV Pelletron Tandem at the Horia Hulubei National Institute for Physics and Nuclear Engineering (IFIN–HH), employing the ROSPHERE array. Several branching ratios for energy levels in ^{152,153}Gd have been measured, offering data for the first time and updates of earlier measured values. Furthermore, relative cross-sections regarding the three Gd isotopes have been measured and compared with theoretical calculations from the PACE4 program.

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