Study of neutron deficient ^{192,202}Po nuclei by neutron multiplicity measurements at NAND facility

Ruchi Mahajan [1,*], B.R. Behera[1], Meenu Thakur[1], N. Saneesh[2], Gurpreet Kaur[1], Priya Sharma[1], Kushal Kapoor[1], R. Dubey[2], A. Yadav[2], Neeraj Kumar[3], P. Sugathan[2], A. Jhingan[2], Hardev Singh[4], A. Kumar[1], A. Saxena[5], A. Chatterjee[2], and Santanu Pal[6]

[1]Department of Physics, Panjab University, Chandigarh - 160014, INDIA
[2] Inter University Accelerator Centre, Aruna Asaf Ali Marg, New Delhi - 110067, INDIA
[3]Department of Physics and Astrophysics, University of Delhi - 110007, INDIA
[4]Department of Physics, Kurukshetra University, Kurukshetra - 136119, INDIA and
[5]Nuclear Physics Division, Bhabha Atomic Research Centre, Mumbai - 400085, INDIA
[6]CS-6/1, Golf Green, Kolkata-700095, INDIA (Formerly with VECC, Kolkata)

It is well established that the pre-scission neutron multiplicity is one of the most efficient probes to study the dynamics of heavy-ion induced fusion-fission (FF) reactions. For nuclear reactions with heavy systems, along with pure FF process there is significant contributions from non-compound nuclear processes such as quasi-fission (QF). Several experimental as well as theoretical approaches have been adopted to understand the dynamics of FF process in heavy nuclei. Measurement of pre-scission neutron multiplicities from an isotopic chain will be a suitable tool to disintengale FF and QF processes. This is because FF and QF reactions have their own characteristic reaction times implying that each reaction process is associated with the different pre-scission neutron multiplicity. This abstract report the experimental measurement of pre-scission neutron multiplicities from two compound nuclei, namely ^{192,202}Po populated by ^{48}Ti+^{144,154}Sm systems at 70 MeV of excitation energy. The experiment was carried with Pelletron+LINAC accelerator facility of IUAC, New Delhi, using the National Array of Neutron Detector (NAND) facility. The pre- and post-scission components of neutron multiplicities are obtained from the measured neutron energy spectra by using a multiple source least-square fitting procedure, using the Watt expression. The measured neutron multiplicities are further analyzed with the statistical model of nuclear decay using Bohr Wheeler as well as Kramer's formalism. The disagreement of the statistical model results with the experimental values even at large values of the dissipation coefficient may points towards the presence of QF & fast-fission.