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Probing the fusion-fission dynamics of ^{203}Bi through mass distribution measurements

K. Chakraborty[1], S. Mandal[1], A. Rani[1], C.V. Ahmad[1], N. Kumar[2], N. Saneesh[2], A. Parihari[1], P. Khandelwal[1], P. Sherpa[1], P. Rawat[1], Nandini[1], Anuj[1], S. Kumar[1], P. Verma[3], K.S. Golda[2], M. Kumar[2], A. Jhingan[2] and P. Sugathan[2]

Supervisor: S. Mandal [1]

[1] *Department of Physics & Astrophysics, University of Delhi, New Delhi-110007, India*
[2] *Inter-University Accelerator Centre, Aruna Asaf Ali Marg, New Delhi - 110067, India*
[3] *Department of Physics, Kalindi College, New Delhi-110008, India*

One of the primary objectives to explore heavy-ion induced fusion reactions is to synthesize superheavy elements (SHEs), not present on earth in natural form. The main hindrance in the production of SHEs is the dissociation of the di-nuclear composite system into projectile-like and target-like fragments before it reaches equilibrium which leads to quasifission (QF). Non-equilibrium fission has been observed in nuclei as light as ^{200}Pb with $Z_PZ_T < 700$ (Z_P and Z_T are the atomic charges of the projectile and target, respectively) which is much lower than the threshold value (≥1600) for the onset of QF as per Swiatecki's dynamical model [1]. Further, the suppression in ER cross-sections, one of the signatures of non-equilibrium processes, for the reaction ^{19}F + ^{184}W populating ^{203}Bi as reported by Nath *et al*. [2] prompted us to implore the mentioned reaction through a different experimental observable, fission fragment mass distribution which is a well established method to ascertain the presence or absence of QF in a reaction. The experimental work has been carried out at Inter University Accelerator Centre, New Delhi, India. After populating ^{203}Bi in the excitation energy range of 80-110 MeV, its fragment mass distribution has been extracted through two large area (20 ×10 cm^2) Multi-Wire Proportional Counters kept at folding angles. The variance of the width of the fragment mass distribution with excitation energies has been studied to examine the deviation, if any, from complete equilibriation. Detailed results will be presented during the workshop.

References

[1] W. J. Swiatecki, Physica Scripta **24**, 113 (1981).

[2] S. Nath *et al*., Physical Review C **81**, 064601 (2010).