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Comparative study of four reactions at onset of pre-equilibrium emission

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The study of the emitted particles, comparing pre-equilibrium and thermal components, is a useful tool to examine the nuclear structure. Possible clustering effects, which may change the expected decay chain probability, could be highlighted on the competition between different reaction mechanisms. The NUCL-EX collaboration (INFN, Italy) has carried out an extensive research campaign on pre-equilibrium emission of light charged particles from hot nuclei [1]. In this framework, the reactions ^{16}O+^{30}Si, ^{18}O+^{28}Si, ^{19}F+^{27}Al at 7 MeV/u and ^{16}O+^{30}Si at 8 MeV/u have been carried out using the GARFIELD+RCo array [2] at Legnaro National Laboratories, as a first step, where the fast emission mechanisms could be kept under control.

After a general introduction on the experimental campaign performed on different systems, which have evidenced anomalies in the α-particle emission channel, this contribution will focus on the analysis results obtained in the measurement reported above, showing in an exclusive way the observed effects related to the entrance channels. The experimental results will be compared to model prediction, for which the same filtering and complete event selection have been applied.

[1] T. Marchi et al., F. Gramegna et al. - Nuclear Particle Correlations And Cluster Physics –Chapter 20 –pag. 507 (2017) –ISBN 978-981-3209-34-3; L. Morelli et al., Journ. of Phys. G 41 (2014) 075107; L. Morelli et al., Journ. of Phys. G 41 (2014) 075108; D. Fabris et al., PoS (X LASNPA), 2013, p. 061.D; V.L. Kravchuk, et al. EPJ WoCs, 2 (2010) 10006; O. V. Fotina et al., Int. Journ. Mod. Phys. E 19 (2010) 1134.
[2] F. Gramegna et al., Proc. of IEEE Nucl. Symposium, 2004, Roma, Italy, 0-7803-8701-5/04/; M. Bruno et al., M. Eur. Phys. Jour. A 49 (2013) 128.

Primary author: CICERCHIA, Magda (LNL)

Presenter: CICERCHIA, Magda (LNL)

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