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Sysmatics of charged-particle radioactivities and implications on nuclear structure effect

Starting from the R-matrix description of the charged-particle emission, we found a generalization of the Geiger-Nuttall law in alpha radioactivity[1]. It relates the half-lives of monopole radioactive decays with the Q values of the outgoing particles as well as the masses and charges of the nuclei involved in the decay[1,2]. The new formula explains well all known cluster emissions, ranging from proton to heavier cluster radioactive decays. It may help us in the searching new cluster decay modes and detecting alpha decays of superheavy nuclei.

In a few proton and alpha decay cases, significant differences are seen between experimental decay half-lives and predictions of the formula. We found that this can be related to the sudden change in the underlying nuclear structure[3]. This large variation makes cluster decay a powerful tool to study the structure of decaying nuclei.

[1]C. Qi, F. R. Xu, R. J. Liotta, and R. Wyss, Phys. Rev. Lett. 103, 072501 (2009).

[2]C. Qi, F. R. Xu, R. J. Liotta, R. Wyss, M. Y. Zhang, C. Asawatangtrakuldee, and D. Hu, Phys. Rev. C 80, 044326 (2009).

[3]C. Qi, R.J. Liotta, P. Van Duppen, and R.A. Wyss, to be published.

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no

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yes

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yes, i am a postdoc

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