

Researchers observe a new kind of disbandment in the atomic nuclei rich in protons

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An experiment led by researchers Sonja Orrigo and Berta Rubio, from the Grupo de Espectroscopia Gamma de l'Institut de Física Corpuscular IFIC (centre that belongs to the University of Valencia and the CSIC) observed an exotic disbandment mode in the beta disbandment of the ^{56}Zn . The results dicovered by an international team in the Ganil Lab (France) have been published in *Physical Review Letters*.

Beta disbandment is one of the most usual kinds of radioactive disbandment and it allows the [nucleus](#) to transform a neutron into a proton or a proton into a neutron when there is too much abundance of one of them.

This ^{56}Zn nucleus is very far from the so-called 'valley of stability', where the nuclei which are stable and exist in Nature is placed.

One of the basic questions for Nuclear Physics is the understanding of the [atomic nuclei](#)'s structure, how protons and neutrons keep themselves united allowing the formation of the nuclei. This, which is well-known in [stable nuclei](#) that result in Nature's elements, but it is not so widely known in exotic nuclei, elements created in labs which are far from stability, disbanding almost immediately.

In nuclei's beta disbandment of proton-rich nuclei, the nucleus usually loses energy emitting protons, because the strong interaction dominates

over the electromagnetic one (emission of [gamma rays](#)). The final nucleus can stay in an excited state and emit a gamma ray at the same time. The process is, hence: beta-proton-gamma. However, the researchers from the IFIC have now observed the inverted process, measuring within the beta disbandment of the ^{56}Zn the sequence beta-gamma-proton, where the gamma ray is emitted first and then the proton. This unusual way of disbandment has only been recently observed in a much more light nucleus, that of Argon 32 (^{32}Ar).

According to the IFIC researchers "this strange form of disbandment is very interesting because it helps us understand the nucleus' structure". But, in addition, this measure has a huge impact because it affects the traditional form of measuring disbandment processes in exotic nuclei rich in protons. According to Sonja Orrigo, this measure will be fundamental for future experiments done in heavier exotic nuclei, as the ones that will be carried out the Japanese Lab of Nuclear Physics REIKEN, also lead by the research group of the IFIC.

More information: S. E. A. Orrigo, et al. "Observation of the β -Delayed γ -Proton Decay of Zn^{56} and its Impact on the Gamow-Teller Strength Evaluation," *Phys. Rev. Lett.* 112, 222501 – Published 3 June 2014. journals.aps.org/prl/abstract/...ysRevLett.112.222501

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