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(G*) Exploring the limits of existence of heavy, neutron-deficient nuclei

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Nuclear isotopes are nuclei with a fixed number of protons Z but with a varying number of neutrons N. The question of how many neutrons a certain element can have while maintaining its stability against neutron or proton emission, or in other words where the proton and neutron drip-lines lie, has been troubling not only nuclear physicists but also astrophysicists since it can help answering fundamental questions like "Where do the stable elements of our universe come from?"Unfortunately, the experimental study of very exotic isotopes very close to the drip-lines is often impossible due to their extremely short half-lives and low production yields.

To tackle the current lack of experimental data, we used the mass measurements of three neutron-deficient nuclei performed with TITAN's MR-TOF mass spectrometer and known reaction energies to extract the masses of 20 nuclei on the border of nuclear stability or past it. With these new mass values, we determined the proton drip-line in the region around Z=78 and we compared our results with various theoretical models.

With the added benefit of the exotic character of these newly determined masses, we leapt into investigating possible Thomas-Ehrman shifts in the region. This unusual effect has been well established in some light and medium nuclei but never conclusively observed in heavier species.

Our calculation procedure as well as our results will be presented.

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