Research study on the location of the Island of Stability of Super-Heavy Elements

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An international research group – with the participation of the University of Granada – has achieved to measure the effects of layers on super-heavy elements, which provides useful data on the nuclear structure of these as-yet undiscovered elements in Nature. These results might be useful to locate the so-called "Island of Stability" introduced by a theory that states the existence of highly stable super-heavy elements with very long average lives. The researchers measured the isotopes of nobelium and lawrence using a particle accelerator at the Center of for Heavy Ion Research (GSI), Darmstadt (Germany).

The research group included members of the GSI, the Helmholtz Institute (Mainz, HIM), the universities of Giessen, Granada, Greifswald, Heidelberg, Mainz, Munich and Padua, the Max-Planck Institute of Nuclear Phyisics (Heidelberg) and the PNPI Institute (St. Petersburg).

Super-heavy elements are elements with an atomic number (number of protons in the nucleus) greater than that of Lawrence (Z=103). These elements are not found in Nature, and they are created in nuclear physics labs – as GSI – through the bombardment of elements in a particle accelerator. –Super-heavy elements are created in quantities on the atomic scale and no method of mass creation has been found. However, there are predictive theories that state that a group of extremely stable super-heavy elements exist in the so-called Island of Stability

The stability of super-heavy elements is caused by the "layer effects" in the atomic nucleus. The components of the nucleus – protons and neutrons - are arranged in layers. There are layers full of protons or neutrons – referred as "magic layers" - that are strongly bound, which results in extremely stable elements. Without this bonding, super-heavy elements would immediately disintegrate due to Coulomb's repulsion among protons.

The University of Granada is developing a quantum sensor, a unique device for measuring the greatest mass of nuclei ever measured (because of technical limitations), which will be published in *Science*. This device will be integrated into the GSI's accelerator in Germany, in the SHIPTRAP facilities.

The development of this measuring device (which started in November 2011) has been enabled by a grant of 1.5 million euros, one of the highest grants ever awarded to the University of Granada for a specific project. This grant was awarded to Professor Daniel Rodríguez by the European Research Council in 2011 within the topic framework "Fundamental Constituents of Matter"

More information:
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