RESEARCH
LUNA: NEW CLUES ON THE PRODUCTION OF HEAVY ELEMENTS IN THE STARS

How are heavy elements produced in stars? The scientific collaboration of the LUNA* experiment (Laboratory for Underground Nuclear Astrophysics), which operates at the INFN Gran Sasso National Laboratories, has recently published new results in the prestigious scientific journal *Physical Review Letters* that could help us answering this question, which has engaged physicists and astrophysicists for decades.

Emerging from an experimental campaign that lasted about four years, the result concerns a particular process that leads to the production of neutrons starting from a carbon 13 nucleus and a helium nucleus. Neutrons, in fact, are essential in the production of heavy elements, as they can be easily “captured” by the nuclei present in the stars, thus allowing the synthesis of elements heavier than Iron, such as Cadmium, Tungsten or Lead. For the first time, the LUNA collaboration measured the speed of this process directly at stellar temperatures with extremely high precision, providing invaluable information for building models that reproduce stars’ evolution.

The LUNA experiment will continue its scientific activity in the next decade thanks to the project under construction LUNA-MV, which will reproduce in laboratories the processes that take place in the heart of large-mass stars.

* LUNA is an international collaboration of about 50 Italian, German, Scottish and Hungarian researchers in which the INFN National Institute for Nuclear Physics for Italy, the Helmholtz-Zentrum Dresden-Rossendorf for Germany, the MTA-ATOMKI for ‘Hungary, the School of Physics and Astronomy, of the University of Edinburgh for the United Kingdom. In Italy, the INFN Gran Sasso National Laboratories, the INFN divisions and the universities of Bari, Genoa, Milano Statale, Naples Federico II, Padua, Rome La Sapienza, Turin and the INAF Observatory of Teramo collaborate in the experiment.