

Lead from a Roman ship to be used for hunting neutrinos

April 16 2010

(PhysOrg.com) -- Italy's National Institute of Nuclear Physics, at its laboratories in Gran Sasso, has received 120 lead bricks from an ancient Roman ship that sunk off of the coast of Sardinia 2,000 years ago. The ship's cargo was recovered 20 years ago, thanks to the contribution of the INFN, which at the time received 150 of these bricks. The INFN is now receiving additional bricks to complete the shield for the CUORE experiment, which is being conducted to study extremely rare events involving neutrinos. After 2,000 years under the sea, this lead will now be used to perform a task 1,400 metres under the Apennine mountain.

The National Laboratories of Gran Sasso (LNGS) of Italy's National Institute of [Nuclear Physics](#) (INFN) has received 120 2,000-year-old lead bricks from the National Archaeological Museum of Cagliari in Sardinia. The lead bricks, together with the ship that transported them, had remained in the sea for 2,000 years, which reduced by approximately 100,000 times the albeit very low original radioactivity represented by one of its radionuclides, lead-210. In fact, lead-210 has a half-life of 22 years, so that by now it has practically disappeared in the bricks.

It is precisely this characteristic that makes the lead extremely useful, in that it can be used to perfectly shield experiments of extreme precision, such as those conducted in the underground INFN laboratories in Gran Sasso. After 2,000 years under the sea, this lead will now be used to perform a task 1,400 metres under the Apennine mountain.

The part of the bricks that is "adorned" with inscriptions will be removed and conserved, whereas the remaining part will be cleaned of incrustations and melted to construct a shield for the international experiment CUORE, a study on [neutrinos](#), whose discoveries could contribute to the knowledge of this elusive particle and of the evolution of the Universe.

Moreover, the INFN will perform important precise measures on the lead (and possibly on the copper found on the ship), to study the materials used in the Bronze Age.

The lead bricks were made available as the result of a 20-year collaboration involving the INFN, its facilities in Cagliari, and the Archaeological Superintendency of Cagliari, with the support of the General Direction of Antiquity. As part of this collaboration, 20 years ago the INFN contributed 300 million lira for the excavation of the ship and the recovery of its cargo.

The INFN would like to thank the superintendents Drs. Fulvia Lo Schiavo and Marco Minoja, as well as Doctor Donatella Salvi, for their collaboration.

"The commander of that ship would certainly never have imagined that the lead would be used 2,000 years later for something that had to do with the Universe and the stars" - comments INFN President Roberto Petronzio - "History and Science can now speak to one another across the centuries, thanks to the research in High-Energy Physics".

"This lead," - explains Professor Ettore Fiorini - "which is responsible for the CUORE experiment, represents an extremely important material for shielding the apparatuses used to conduct research on rare events - a material that must be totally free of [radioactive](#) contamination".

Lucia Votano, Director of the INFN laboratories in Gran Sasso, explains that "it's great and unique that the most advanced and innovative technologies must rely on archaeology and the technology of the ancient Romans. The ancient lead recovered from the bottom of the sea will be essential for protecting the experiment from natural radioactivity, which could obscure the rare process of neutrinoless double beta decay".

Provided by INFN

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