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Volcanoes, pyramids and subsoil: cosmic muons can reveal their secrets

Is it possible to "look" inside massive objects to discover their secrets?
At the beginning of the twentieth century, the X rays, recently discovered, were used to observe the inside of the human body, opening a new frontier in the field of medical investigations. This incredible property is due to the ability of the X-rays not to stop on the surface of objects, as happens instead for the light, but to penetrate inside the bodies. However, they can reach a maximum of dozens of cm, after which they are completely absorbed and can no longer provide us with useful information.
In nature, however, other forms of radiation exist. Among these are the muons, elementary particles with electric charge. Very energetic muons are naturally present on the earth's surface. They are produced in the atmosphere, where the primary cosmic radiation interacts with the air nuclei. The cosmic muons are very penetrating and can even cross hundreds of meters of rock. This property allowed physicists to use muons in a similar way to X-rays, developing a technique of muon radiography (sometimes also called muography) able to observe through very thick bodies, such as pyramids and volcanoes or scrutinize under hundreds of meters in the underground. One of the first attempts to use this property was to search for hidden chambers inside the pyramids. In the late 1960s, Luis W. Alvarez sought a hidden chamber inside the Chefren pyramid. Recently a group of researchers has discovered a large void within the pyramid of Cheops. In Italy we use muography for the study of volcanoes (Vesuvius, Etna, Stromboli) or to investigate the subsoil in search, for example, of cavities or archaeological remains. During the seminar the principles and the applications of muon radiography will be illustrated, focusing the attention on the activities carried out in collaboration with the INFN.

***A* round-table discussion will follow with civil engineers about possible applications of muon radiography.**

7 marzo 2018 - h 14:30

Laboratori Nazionali del Gran Sasso

Aula “B. Pontecorvo”

Via Giovanni Acitelli 22, Assergi (L’Aquila)

http://agenda.infn.it/event/cosmic_muons