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Press Release

Cairo, June 7th 2016

#ScanPyramids team deploys Muons detectors at Giza in order to “scan” Khufu’s Pyramid

Having been able to demonstrate the efficiency of Muons technology at the Bent Pyramid in Dahshour (http://www.hip.institute/press/HIP_INSTITUTE_CP7_EN.pdf) the international #ScanPyramids team lead by the Faculty of Engineering - Cairo University, and the HIP Institute (www.hip.institute) is now deploying Muon non-destructive technology at Giza plateau aiming at performing a full “scan” of the Great Pyramid.

The #ScanPyramids project is currently “scanning” the Great Pyramid of Giza using three different techniques as described in the following video www.vimeo.com/hipinstitute/muons):

- The first technique is based on chemical emulsions made by Nagoya University (Japan) and placed inside the Great Pyramid at different places (Queen Chamber, Queen Chamber Niche, Lower Chamber). In total, 80 emulsion films will be exposed to Muons natural flow during 40 days before a long period of analysis.

- The second technique is employing gas electronic detectors specially fabricated by the CEA (French Alternative Energies and Atomic Energy Commission), and were placed outside the great pyramid. The “Alhazen” and “Alvarez” detectors will be running for a whole month of

calibration in order to detect known voids, and then will be pointed to specific targets trying to identify unknown voids. A third detector will also be used in the next days.

- The third technique is based on plastic electronic scintillator conceived and made by the High Energy Accelerator Research Organization (KEK – Japan) which is planned to be placed inside the Queen Chamber in July.

Results of the new Muon campaign performed by the #ScanPyramids team will be shared for analysis and interpretation with several committees representing various scientific disciplines (physics particles, architecture, mechanical engineering, egyptology, archeology, etc.). A committee of Egyptologists have been formed by the Ministry of Antiquities, in order to observe the results of the #ScanPyramids project. The committee of egyptologists is led by Dr. Zahi Hawass, the former Minister of Antiquities, and is operating under the auspice of the Ministry of Antiquities.

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More information on Muography

Muon particles permanently reach the Earth with a speed close to the speed of light and a flux around 10,000 per m² per minute. They originate from the interactions of cosmic rays created in the Universe with the atoms of the upper atmosphere. Similarly to X-rays which can penetrate our body and give access to bone imaging these elementary particles, also called “heavy electrons”, can go through hundreds of meters of stones before being absorbed. Judiciously placed detectors (for example inside a pyramid, below a potential, unknown chamber) can then record particle tracks and discern cavities (which muons cross with practically no interactions) from more dense regions in which some muons are absorbed or deflected. The challenge of such measurements consists in building extremely precise detectors and in accumulating enough of data (during several days or months) to increase the contrast.

The muography technique is nowadays frequently used in volcanology, in particular by the research teams of Nagoya University. Within the ScanPyramid mission, 3 types of detectors have been developed. Nagoya University uses chemical detectors based on silver emulsion films. The KEK has built an electronic device working with muon sensitive, scintillating plastics. Such instruments allowed in particular the imaging of the inside of nuclear reactors in Fukushima. Concerning the muon telescopes of CEA which joined the mission on April 15th, they are made of gaseous detectors based on an argon mixture. On the contrary to chemical emulsions, electronics instruments (plastic or gas) allow for a real time imaging.

About #ScanPyramids

#ScanPyramids mission (www.scanpyramids.org) was launched on 25 October 2015 under the authority of the Egyptian Ministry of Antiquities and is led by Faculty of Engineering, Cairo University, and HIP.Institute (www.hip.institute) , Paris (Heritage, Innovation and Preservation Institute). This project aims at scanning, over a year, some of the Egyptian

Pyramids: Khufu, Khafre, the Bent and the Red Pyramids. #ScanPyramids combines several non-invasive and non-destructive scanning techniques in order to try to detect the presence of any unknown internal structures and cavities in ancient monuments, which may lead to a better understanding of their structure and their construction processes / techniques. This mission is using, today, Infrared thermography, muon tomography and 3D reconstruction techniques.

Several international scientific institutions are part of #ScanPyramids: Nagoya University (Japan), KEK (High Energy Accelerator Research Organization – Tsukuba – Japan) and CEA (French Alternative Energies and Atomic Energy Commission – Saclay - France) for muon techniques and Laval University (Quebec – Canada) for infrared thermography.

VIDEO

www.vimeo.com/hipinstitute/muons

PICTURES

http://www.hip.institute/press/pictures/Pictures_HIP.Institute_Starting_Khufu_Muography.zip

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CONTACTS

Website : <http://www.hip.institute>

#ScanPyramids: <http://www.scanpyramids.org>

Twitter account: @HIP_i_

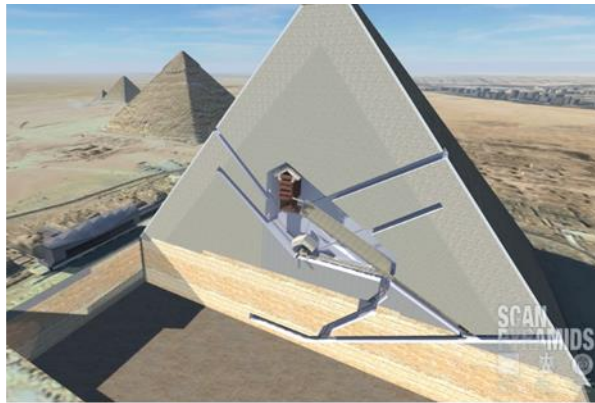
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3D View Cut of Khufu's pyramid (Giza Plateau)



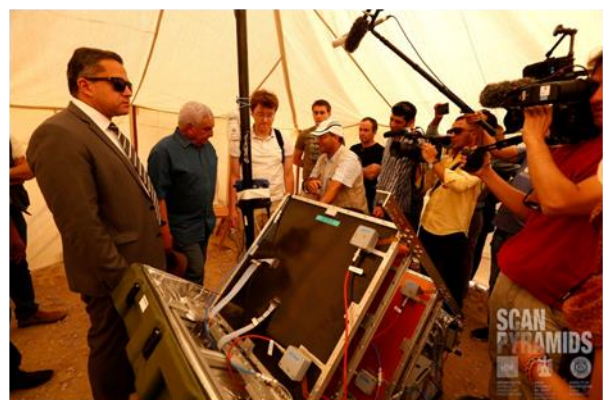
Muons Emulsion plates set up in Khufu's lower chamber



Muons Emulsion plates set up in Khufu's Queen chamber



Alhazen Muons Telescope set up outside the Great Pyramid



#ScanPyramids engineer describing to the Antiquities Minister Dr. Khaled El-Enany and to Dr. Zahi Hawass, heading the egyptologists committee, the gas muon telescope principles.