ALICE2 Case Study

LAGO: By making use of RedCLARA, Latin American scientists aim to measure the radiation of gamma ray bursts and solar activity

59 researchers from 21 institutes in 11 countries from all over the world constitute LAGO (Large Aperture Gamma Ray Burst Observatory), a project which aims to measure the radiation of gamma ray bursts by making use of Cherenkov water detectors.

After six years, they have accomplished the installation of sensors in six countries in the region and are already working on the development of data repositories through virtual collaboration environments implemented over RedCLARA.

High-altitude zones with privileged skies for Astrophysics and a dedicated team of researchers are the elements of LAGO, a large aperture observatory for the study of the gamma ray bursts which hit the Earth.

"In 2004 we conducted a study through which we discovered that the 1.600 Pierre Auger detectors used in Geiger mode, at an altitude of 1.400m were as sensitive to gamma ray bursts as the detectors in the Chaclataya observatory (Bolivia), which being located at 5.300m served as a referent", indicates Xavier Bertou, leader and spokesman of the Collaboration of the Bariloche Atomic Centre in Argentina and coordinator of the LAGO Community.

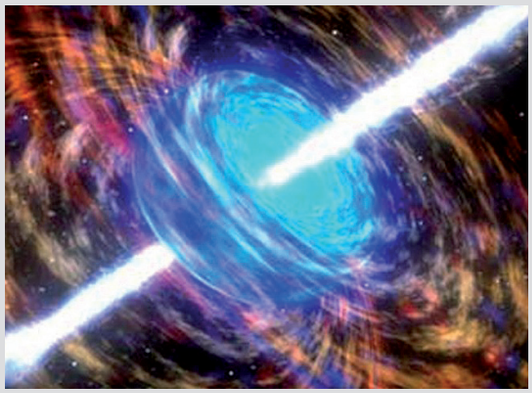
According to Bertou, the scientific goals are to observe the high-energy part of gamma ray bursts from the ground – something that has not been cogently accomplished in any other previous experiment-, and measure solar activity through the modulation it produces over the flow of galactic cosmic rays. "To do this, we need to have several operational sites, and compare measurements made by different groups", he adds. Argentina, Bolivia, Mexico and Peru already feature detectors recording data; the other countries are installing their own.

As a competitive initiative developed in Latin America, which makes the most out of the geographical conditions and expertise of several groups in working at high altitudes, Humberto Salazar Ibargüen, manager of the LAGO site in Sierra Nevada, describes the Project as: "The reduced cost of the experiment, and the development of human resources, both in the technological and scientific areas, are aspects which highlight this competitiveness".

Currently, the data generated between the different LAGO centres are transferred through RedCLARA, and according to Bertou they amount to around 5 to 10 GB per month per site, depending on the quantity of detectors, an amount that turns out to be quite important considering their location and the sites' connection difficulties. "We have to collect the data in one computing centre in order to be able to analyse them. These data usually consist in 4 counting rates every 5 milliseconds for each detector, which can be a lot to transfer between our countries, particularly when local networks do not feature a very high speed. Until now, the best solution was to carry the data in a hard disk to the LAGO annual workshop, but we are working to be able to communicate regularly through videoconference, share data and have a sort of virtual LAGO observatory where one can access all the data without having to worry about where they come from. In order to do all this we want to have the support of RedCLARA", Bertou points out.

Gamma rays: the most energetic phenomena in the Universe

Gamma radiation or gamma rays (γ) are a type of electromagnetic radiation produced by extremely energetic astrophysical phenomena; they occur in random positions of the sky and their origin still remains under scientific discussion. In any case, they seem to constitute the most energetic phenomena in the Universe. In general, the ones produced in space do not reach the earth's surface since they are absorbed in the high atmosphere. The exceptions are those whose energy is above a few thousand gigaelectronvolts (or GeV) that by falling on the atmosphere produce thousands of particles (extensive atmospheric cascade) which are located in the Earth's surface through detecting tanks that make it possible to see the Cherenkov radiation produced by them as they cross the water.



Online research

In order to develop a virtual research environment which makes it possible to record, catalogue, protect and share the data obtained y the detectors already installed, LAGO Virtual was implemented. This is an online space which makes it possible to: access and control the equipment remotely, conduct simulations of the detectors' operation, protect and catalogue data (recorded and synthetic) in each of the facilities, share data and publications generated by each of the LAGO groups, and interact in real time (chat and videoconference).

"Since this is a Project that brings together many countries with few participants in each, and taking into account the fact that in the places where the detectors are located it is difficult to access a network, it becomes crucial that we have a large capacity communication system. After this, we will need to bring together and organise the data in order to analyse them in a more simple and generic way. Here RedCLARA will also be enormously helpful".

***Xavier Bertou**, leader and spokesman of the Collaboration of the Bariloche Atomic Centre in Argentina.*

"In CONIDA (National Commission of Aerospace Research and Development) we didn't have any knowledge about the construction of particle detectors and, thanks to collaborative work, we have benefitted from the experience in the construction of Cherenkov tanks and in the positioning of sensors at high altitude, which has enabled the development of our detectors in a speedy way".

***Luis Otiniano Ormachea**, Researcher from the National Commission of Aerospace Research and Development, CONIDA, from Lima, Peru.*

"We make use of RedCLARA to participate in internal and external meetings, which strengthens the constitution of the LAGO collaboration and its visibility within the scientific community. The web-based communication has facilitated the conduction of enquiries and meetings to discuss issues and make decisions. RedCLARA allows us to use the most advanced communication technology to bring the different Project groups together".

***Humberto Salazar Ibargüen**, PhD in Physics, member of Meritorious Autonomous University of Puebla in Mexico and manager of the LAGO site in Sierra Negra, México.*

More information:

LAGO |
http://particulas.cnea.gov.ar/experiments/lago/

LAGO Community |
http://cevale2.uis.edu.co/~cevale2/wiki/index.php/WikiComunidadLAGO

LAGO virtual |
http://cevale2.uis.edu.co/~cevale2/wiki/index.php/LAGOVirtual

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