

Astrophysics

Pierre Auger Project

The Pierre Auger Project aims at studying a foremost issue in astrophysics today, the origin of the most energetic cosmic rays with energies in excess of 10^{19} eV, focusing our attention in energies above 10^{20} eV. The flux of these latter cosmic rays is roughly estimated to be less than $3/\text{km}^2/\text{century}$ and due to this, an International Collaboration spanning institutions in 14 countries has been formed in order to build two similar observatories $3,000 \text{ km}^2$ each, one in the southern hemisphere (in Malargüe, Province of Mendoza, Argentina) and one in the northern hemisphere (in USA).

Two experimental techniques are used: surface detectors and fluorescence telescopes. Such hybrid approach diminishes systematic errors and allows measuring both lateral and longitudinal shower profiles, respectively. The construction of the southern observatory has begun and first step, called the Engineering Array phase, consisting in 32 surface detectors, two fluorescence telescopes, telecommunications and Central Station buildings has finished and full construction started.

CNEA leads the Project in Argentina and alongside with Mendoza we have undertaken the following responsibilities (many tasks with the help of Centro Atómico Constituyentes/Balseiro, Complejos Fabriles San Rafael y Malargüe, and Universidad Tecnológica Nacional – Mendoza/UTN).:

1. Construction of rotomolded tanks (mold construction and tests). We have to provide 550 out of the 1600 surface detectors. We have had two molds and a few prototypes built. We are in the process of commissioning tanks for the Project.
2. Design and construction of rotomolded battery boxes. We have provided all of the battery boxes installed in Malargüe and have to provide the rest of the 1600 required.
3. Manufacture of liners. We built a Liner Plant in UTN-Mendoza which is now fully and satisfactory operational. We plan to submit it for ISO 9001 certification.
4. Manufacture of solar panels aluminum brackets. We have searched different manufactures and assigned the job, brackets are already produced according to our request and are already installed in Malargüe
5. Facility building and testing of phototubes. All 4800 surface detector phototubes are now tested in Malargüe quite satisfactory. The building facility was provided by CNEA and the trained personnel is from UTN-Mendoza.
6. Telecommunications. We are providing all of the 1600 antennae for the tanks and telecommunication towers. We have instrumented all tanks deployed (under the technical supervision of UTN/Mendoza) and built 3 (out of 5) towers.

7. Pure water production, storage tanks, transportation tanks. We had a bidding for the water plant, which was bought and it is now operational (though we had a variety of technical problems). We designed and bought the two water transportation tanks and the storage tank. We are routinely delivering 12 tons of pure water to each surface detector. Also performing the bacteriological tests
8. We are involved in all of these site activities
9. Surface detectors assembly and commissioning
10. Mirror Data Center at Centro Atómico Constituyentes. We have a working computing center which currently stores all data taken in Malargüe, for further use of scientists. We envisage continuing efforts in this matter.
11. Outreach. We are involved in outreach activities, such as seminars in/to schools, and in communicating with the society through media. A Planetarium will be built in Malargüe by some members of the International Collaboration.
12. Data Analysis. Auger is already taken valuable data and we are dedicating an increasing time to it. We concentrate in surface detector calibration, LIDAR studies and absolute fluorescence telescope calibration, and anisotropies. We are currently working in a possible new detector component, muon counter to help in the primary chemical composition.