

Pierre Auger Project Progress Report

Summary (photo album)

As a result of an intense effort in the past three months, significant improvements were made in the data taking operation in the Fluorescence Detector, CDAS and Comms. In particular, a tentative solution to the previously intractable Fire Wire bug in the FD readout has been found. Although much work remains, we should see much improved efficiency in the data taking.

There are now 1067 tanks deployed in the field of which 914 are taking data. Deployment has slowed substantially because of the lack of new positions. Large areas in the north remain inaccessible. The Province of Mendoza is helping to solve the problems with the land owners. The slow down in detector assembly has allowed the staff to concentrate on non-working stations. As a result there are now (21 December 2005) only five non-working stations.

Work on the Loma Amarilla fluorescence building has started but seems to be progressing slowly.

The Auger Celebration was a great success. Twice as many people attended than had been expected. Many important visitors told us how impressed they were with the Observatory.

WBS 1.1 Fluorescence Detector (Jonny Kleinfeller – Karlsruhe)

FireWire Bug:

We have at least a temporary solution for the FireWire bug. In fact there are two solutions. One has already been tested, the other is going to be tested this week.

There is obviously a conflict between LAN, FireWire and processor board. It turned out, using the LAN port on the processor board, eliminates the bug, but has some drawbacks.

The on board LAN is a priori not configured to work with network boot, which is required for our system. This can be changed with some program on a flash card, changes in the BIOS, and modification of the kernel. It is not an elegant solution, but it works and should be regarded as a temporary solution.

The other solution is based on a replacement of the existing LAN card, this has been tested in Karlsruhe, but not yet on site. If this works, this solution could be accepted as a final solution.

I would not be totally happy with this solution, because we still don't know exactly why this bus conflict exists, there remains a risk, that in future with a kernel or hardware upgrade the bug pops up again.

Status of FD:

There are still three corrector lenses not yet mounted, they are on site, but there is lack of manpower.

There is no progress at Loma Amarilla.

Karlsruhe has decided to upgrade/exchange the Brazilian shutters at Los Leones and Coihueco in March 2006.

The lightning protections of the power lines are still missing, the surge protectors at the three building are being installed.

The 3 months stay of Hermann-Josef Mathes in Malargüe was very successful. The DAQ software is much more stable now, many bugs have been eliminated. An upgrade of the Slow Control software is as of today in operation. A new interface has been developed to free Slow Control access from MS-Internet Explorer, it has been tested extensively, works well, and will, after some extensions and upgrades, become the standard access to the Slow Control PC. Currently it should be used in parallel to the Explorer access for reliability tests.

We are one step closer to merging DAQ and SCS to achieve automation.

WBS 1.1.3.3 Fluorescence Detector Atmospheric Monitoring (Stefan Westerhoff – Columbia)

LIDARs (reported by R. Mussa)

(1) Lidar Morados commissioning:

The system is ready to start operations: the high-repetition laser, Licel and 2 photomultipliers have been installed and tested, and first signals were seen (see photos). All subsystems are connected to UPS, and new cover motors allow to shutdown everything and close the cover in case of power outage. Insulation transformers were installed to protect the equipment from faults in the electric power supply. A missing fiber link inside the FD prevented us from receiving triggers from the FD building. It should be ready for remote operations by next shift.

(2) Lidar Coihueco:

Running smoothly. It was possible to operate it via VNC from Morados.

(3) Shoot-the-Shower and Runcontrol Software:

GUIs were largely improved to stabilize running operations. The communication software between lidar PCs and irene was improved to remove destructive interferences between sockets which were causing T3 losses. FDmon and SDmon are now running smoothly.

FRAM (reported by M. Prouza)

During the October/November stay the telescope was significantly upgraded and the most serious problems, which were limiting its observation capabilities, were removed.

First, the flip mirror (switching the light between the NF camera and photometer) was replaced by a semitransparent mirror and second, the not enough sturdy WF camera mount was replaced by a new one. Furthermore, the emergency roof-closure system using auto batteries was installed.

The change of the mirror proved to be highly useful, because now we are able to do simultaneous observations using both instruments. Most important is the fact that now we can do 'NF camera guiding' - it is to center the studied star into the center of the field of view of the photometer and control this position during the whole photometric observation. The only remaining problem is the not optimal transmissivity of the current semi-transparent mirror, which strongly suppresses some parts of the light in the spectral range between 300-400 nm. Therefore, we plan to replace only the mirror itself during February/March for a more suitable one.

The change of the WF camera mount revealed that unfortunately not all the misalignment was caused by the non-sufficient rigidity of this mount. The effect was diminished only by a some fraction, the remaining part is very probably due to deformation of the support structure of the secondary mirror of the main telescope.

However, we modified our software and we are modeling this WF/NF misalignment and we center to different positions at the WF camera for the different positions at the sky. For the correction of position of the star on the NF camera we then use again the NF camera guiding.

Thus, both changes allow almost regular and successful photometric observations of the HAM source since late October and we finally have successful and automatic photometric observations of standard stars since the end of November. The star observation is still being tuned-up, we are optimizing guiding scripts and solving some minor hardware problems with centering movements of the mounts.

To summarize, during the last months FRAM finally made the transition from the testing period to the observation period. FRAM is now regular taking photometric data of the HAM source and we already have individual photometric observations of standard stars. The data processing is also in progress.

The figure shows the FRAM telescope in its new configuration. The new mount of the WF camera and the black box with the semitransparent mirror are visible.

WBS 2.1 SD (Ingo Allekote – Instituto Balseiro)

During this period, 120 tanks arrived to Malargue, from Rotoplastyc (Brazil). Also, four Engineering Array tanks were recovered from the field. 60 tanks were assembled, 68 were transported and installed in the field, 67 filled with water and 45 got the E-kit installed and were

put into operation.

As of December 16, 2005, there are 1067 tanks deployed, 1042 with water and 919 with electronics. A total of 433 tanks were installed in the field during all of 2005.

The most pressing problem at present is the lack of positions to deploy new detectors, as 5 landowners possessing huge fields are not willing to sign the access contract. The Province of Mendoza is assisting the Project in trying to find a suitable agreement with these landowners.

Moura Brazil has produced the 900 batteries purchased by Brazil, the importation process has begun and is expected to be completed soon.

Argentina has placed a new purchase order for solar panel brackets and battery boxes with pipes.

WBS 5.0 DPA/Offline- (Bruce Dawson, Markus Roth and Tom Paul)

The Offline team is focusing on preparing the offline software for a production release targeted for January. This work includes improvements in and debugging of the core framework code as well as validation of the OG physics modules, which will be mainly used in the first production runs. Previous work on large-scale production, particularly at UCLA and the University of Chicago, have helped to uncover several issues that need to be addressed in order to run more smoothly in the future.

A developer meeting was held at the CBPF in October to work on technical issues and to plan and prioritize future activities. A synopsis of the work accomplished and the outcome of meeting discussions is available at: <https://www.auger.unam.mx/AugerWiki/RioMeeting2005>. During this meeting, version 1.3 of the software was released, which includes new code for reading CONEX files as well as improvements in the atmosphere interfaces.

Since the October meeting, some additional tasks have been completed, while new projects have just gotten underway.

On the detector description side, we have implemented high level interfaces to information in the aerosol and the overall atmospheric quality databases. New interfaces to retrieve station positions from the PMS have also been completed. Additionally, code for retrieving T2 status from ASCII files is now available, and a MySQL-based T2 database is in preparation. Work is currently underway to improve database access speed and reduce the associated network traffic. The offline framework and offline database tools have been installed on the calibration computer in Malargue to support filling the calibration and monitoring databases.

The framework configuration machinery has been improved in preparation for the production release. Run configurations are now logged and stored together with events in the offline ROOT files. A configuration override mechanism is also nearing completion, which will simplify the job of generating configuration files for production runs. New CDAS/Offline event converters have been prepared which allow passing information between offline and the Ec, Es, and Er functions of the CDAS code. This will support use of these CDAS algorithms from within the offline software.

More advanced designs for underlying foundation code are also in development which will greatly reduce the amount of redundant code and ease future maintenance. These include new intelligent pointer machinery and a redesign of some other foundation class.

Exploratory work has also been done in other areas, including interesting new techniques for global fitting.

One challenge facing the offline group is the difficulty of dealing with the many different combinations of platforms and external package versions used by the collaboration. To this end, we are setting up a BuildBot system which will carry out automatic CVS checkouts, builds and tests regularly on multiple platforms. This will also help maintain stability

of the CVS head.

The SD reconstruction chain is undergoing a validation phase. In close collaboration with the UCLA group we are investigating possible weak points and failures of the reconstruction. The so far unsatisfactory reconstruction of some 3-fold events is tremendously improved and gives reliable results for the whole data set available. The validation is a prelude for the forthcoming production runs early next year.

WBS 8.0 Education and Outreach (Greg Snow – University of Nebraska)

The Auger Celebration

On November 9-11, 2005 the Auger Collaboration hosted a major Celebration marking the progress of the Observatory and the presentation of the first physics results at the International Cosmic Ray Conference in the summer 2005. Over 175 visitors from almost all of the collaborating countries traveled to Malargüe to attend the Celebration. The visitors included administrators from collaborating institutions, representatives from funding agencies that have supported the Observatory, representatives from the Argentine embassies of collaborating countries, local and provincial government authorities, plus press and media teams.

The program of the Celebration began with a welcoming reception the evening of November 9 in the Auger Visitor Center. At the reception, representatives from the Forschungszentrum Karlsruhe unveiled a handsome scale model of the Observatory donated to the Visitor Center. The model, shown in the photo gallery of this report, has LEDs at each surface detector location that allows recorded air shower events to be visualized in real time. On the morning of November 10, Paul Mantsch, Alan Watson, and Jim Cronin presented the history and status of the Observatory to the assembled visitors in Malargüe's Convention and Exhibition Center. Following a buffet lunch, the Celebration Ceremony took place outside the Auger office building in sunny spring weather. Collaboration Board Chair Teresa Dova introduced the unveiling of a beautiful monument that is shown in the photo gallery. The unveiling was performed by Jim Cronin and a group of Auger graduate students. URA President Fred Bernthal introduced the dignitaries, one from each collaborating country, seated on the platform. Alberto Etchegoyen then introduced speeches by Malargüe mayor Prof. Raúl Rodríguez and Mendoza Province governor Ing. Julio Cobos. The afternoon ceremony was followed by a picnic at the Castillos de Pincheira that featured local cuisine and entertainment by local folk musicians plus traditional dancers and tango dancers. On November 11, visitors had the opportunity to tour the expansive Observatory site – Surface Detectors in the field, the Central Laser Facility, and the Los Morados Fluorescence Detector building.

The Celebration was covered extensively in newspaper, magazine, and television pieces that appeared in several of the collaborating countries, and an article will appear in the CERN Courier in an early 2006 issue.

The Collaboration is indebted to the Observatory staff and the municipality of Malargüe for their many contributions to the success of the Celebration.

The Auger Science Fair

The Auger Collaboration sponsored a Science Fair for teachers and students from high schools in Mendoza Province immediately after the Celebration, November 11 and 12. During the past year, the Science Fair was organized by a committee of four Malargüe science teachers.

Participating school teams consisted, typically, of one teacher and two students who presented a research project on a topic in physics, chemistry, or technology. A total of 29 teams displayed their projects at the fair, some teams traveling long distances to reach Malargüe. The displays were quite sophisticated and represented a lot of work by the participants. The opening ceremony of the Science Fair, held in the Auger Assembly Building, featured introductions and welcoming remarks by Greg Snow, Beatriz García, Verónica Bunsters (head of education in Malargüe) and mayor Prof. Raúl Rodríguez. The projects were judged by a team of Auger collaborators – Carl Bonifazi, Beatriz García, Rebeca López, Miguel Mostafa, Greg Snow, and Jose Valdes-Galicia. The judges considered the science content, oral and visual presentation, and the written report that accompanied each project. In an awards ceremony on November 12, the following superior projects were recognized:

First place: “Aerodynamic Wind Tunnel” by a team from Escuela 4-106 “IV Brigada Aerea” in Mendoza

Second place: “Technological Proposal to Address Pollution in the El Nihuil Lake” by a team from Escuela 4-044 in El Nihuil, San Rafael

Third place: “Magnetic Levitation Train” by a team from Escuela 4-106 “IV Brigada Aerea” in Mendoza

Honorable Mention: “Calcium Sulfate Mill for Agricultural Use” by a team from the Instituto Secundario Malargüe

During the Science Fair, participants were treated to presentations about the Observatory given in the Visitor Center by Analía Cáceres and Beatriz García.

The collaboration is indebted to the Observatory staff, the local organizing committee, Sra. Verónica Bunsters, and the municipality of Malargüe for their help and generous contributions to the success of the Science Fair. Photos from the Science Fair appear in the gallery.

Premier Viewing of New Auger-Related Videos

On November 10 and 11 at the Convention and Exhibition Center, Malargüe students and adults were treated to the inaugural viewing of 2 professionally produced video presentations directed by Christina Raschia in collaboration with Beatriz García. The first, “Space Messengers”, is intended for children aged 6-11, and the second, “An Adventure of the Mind”, is aimed at children over 12 and adults. The videos are in Spanish with English and French subtitles and are available through the Auger Visitor Center.

The James Cronin School

On Friday, November 11, a group of Auger collaborators and Celebration attendees visited the nearly complete new building that will house the James Cronin School of Communication, Art, and Design. Also in attendance were the building’s architect, the school’s headmaster, and a representative from the Mendoza Province Board of Education. A photo of the building appears in the gallery. The school is foreseen to be complete in time for occupancy when the new school year begins in March 2006.

Other Science Outreach during the November Collaboration Meeting

On November 14, Rebeca López presented a workshop on teaching practices in the natural sciences to a group of teachers from Malargüe's Center of Basic Education for Youth and Adults. She covered activities related to speed, acceleration, and Newton's second law. On November 17, Rebeca gave a talk entitled "Cosmic Rays and the Pierre Auger Observatory" to 100 students in grades 6 and 7 at the primary school Capt. José Lemus. Photos appear in the gallery. Rebeca and Arnulfo Zepeda also held discussions with Verónica Bunsters about future workshops for science teachers in Malargüe and a possible collaboration between the municipality and the University of Puebla in Mexico. The Collaboration continued its tradition of participating in the Malargüe Day Parade on November 16.

WBS 9.0 Observatory Operations – (Julio Rodriguez Martino - INFN)

During October and November some DAQ and Slow Control problems continued to affect the FD data taking. The problems in the DAQ are, in principle, understood but not yet solved. The solution seems to be a change of the mirrorPCs, by some new pieces of hardware. Exactly what is producing the problem of the mirrorPCs dropping from the DAQ is not yet clear.

Another software for the analysis of the relative calibration runs was installed in the EyePCs. This compliments the analysis program described in the last report by giving the shifters a "snapshot" of each camera in the FD. It is possible to recognize and report problematic pixels immediately. In addition, a routine analysis of the background measurement is in preparation. This will allow a better estimation of the dead time in each telescope, including times when the shutters close by external factors (rain, snow, wind or light)

The system of volunteers for the Fd shifts will be changed, as agreed during the last meeting in Malargüe. A proposal will be soon circulated among interested people and a decision taken, hopefully before February next year.

Apart from some lightning storms and power cuts, the data taking shifts were successful, with many hybrid, stereo and three-eye events.

