

Pierre Auger Project Progress Report December 2006 & January 2007

Summary (photo album)

Important construction milestones have been passed during the last few weeks.

The Auger fluorescence detector system is now complete. The last fluorescence building at Loma Amarilla at the north end of the array is now finished. The telescopes are in operation and sending shower data to CDAS. The next step will be to perform an absolute calibration of the telescopes. We are looking forward to the first shower event to be recorded by all four fluorescence detector stations.

The second Central Laser Facility called the "XLF" – equidistant from Coihueco, Los Morados and Loma Amarilla - has produced the first vertical beam. The test beam was initiated from CDAS and recorded.

At the end of last year access was obtained to three large properties in the northeast part of the array. These areas together will include most of the rest of the array. Deployment of surface detector stations in the first of these properties, owned by Mr. Villar, was completed in record time. A modified water delivery system has been developed to deal with the long distances to these new areas.

Improved clean room facilities have been installed and new procedures implemented for potting the PMT assemblies. There has been a marked improvement in potting quality and the expectation of a greatly reduced number of PMTs with unstable performance.

Planning is moving forward for Auger North. A design report and an associated R&D plan are in preparation. An R&D array (RDA) of about ten surface detector stations similar to the Engineering Array in Auger South will validate design changes.

WBS 1.1 Fluorescence Detector (Jonny Kleinfeller – Karlsruhe)

Status of Loma Amarilla: February 20, 2007

The Slow Control system, LAN, DAQ are fully operational.

All telescopes will have corrector ring lenses fitted by the end of today.

The cameras of the telescopes are currently being positioned, telescopes 18, 17, 16 and 15 are already done.

Loma Amarilla is scheduled to participate in the current shift with 6 telescopes from Thursday night.

There is still some minor work to be done:

Calibration fibres B for all bays (scheduled for March), calibration fibres C for telescope 17 (scheduled for March), minor work on the light tightness of the shutters (this week).

There is no progress on the LIDAR system at Loma Amarilla since November last year.

Other buildings:

The Slow Control PCs have been replaced in all buildings, the new ones are much faster and hopefully more reliable.

Temperature sensors, read out by Slow Control, have been installed in all buildings to monitor the unreliable air conditioning system.

The new UPS units powering the front end electronics and the Mirror Pcs are now fitted with reset table over voltage protection.

The 3-phase monitoring system for all buildings is on site and will be installed as soon as we get suitable boxes. The power relays are too big to be installed directly inside the switch boxes of the buildings.

A major upgrade of the DAQ software has been installed on the Eye Pcs of Los Leones and Loma Amarilla, the same version will be installed at Los Morados and Coihueco before the end of the shift.

Currently work is in progress for the replacement of the DAQ-Server and the Slow Control Server at CDAS, the hardware is installed, set-up and commissioning will take a few days more.

The model at the entrance of the office building is now running independent of the lack of attention by the Auger staff.

WBS 1.1 Fluorescence Detector cont. (Jan Ridky – FZU)

Our main feat was installation of all mirrors to Loma Amarilla. By no means easy thing as we were pressed from one side by delays and had Christmas on the other side. Peter Schovanek will send some nice photo(s).

Another thing worth remark is change of FD running with smaller exposure to Moon light. Julio may send report on efficiency of December and January shifts.

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

The XLF is operational in engineering mode with a fixed vertical beam. The first light was recorded on Jan 23 2007 (Jan 24 UT). The system was operated from the central campus for this test. Some of the key contributors to this milestone include:

- Land Permissions: I. Allekotte
- Funding: P. Mantsch J. A. J. Matthews
- Container and site prep. Ricardo Perez
- FOPA: C. Hojvat, Adriana Cuartara
- Solar Power: J.A.J. Matthews, B. Miller
- Network: B. Fick, D. Nitz, R. Squartini
- Beam monitoring: P. Sommers, M. Roberts, F. Arqueros
- Phase 1 installation: Jorge Rodriguez
- On-site support: G Avila, R. Pacheco

It is expected that the operation of the XLF (vertical beam only) will become part of the FD shift operation beginning in the Feb. or Mar. dark period. Considerable work remains to complete the remaining phases of the installation which included the steering and automated calibration systems. This work is mostly likely to happen after the ICRC.

WBS 1.2 Fluorescence Detector Electronics digital electronics and readout systems (Matthias Kleifges – FZK-IPE)

Our main goal was achieved with the installation work in Loma Amarilla and in the release of a new DAQ software version.

Performance Monitoring

- MySql data bases for the calibration data have been redesigned. The base is filled with the data recorded in January 2007.
- Other problems with the data base were found and fixed. The filling of tables with background data was started and will continued with data of the latest past soon.
- S: Menshikov has implemented programs to monitor the stability of the different calibration sources (LCU and Xe- flasher).

Installation in Loma Amarilla (LA)

- The front-end electronics for all 6 telescopes in LA were installed in January without problems. This includes the crates, the MirrorPCs, but also the EyePC and the LAN network. The electronic was tested to work properly.
- The installation of some hardware of the slow control and the alignment of the cameras is still pending.

- The data analysis (see GAP note 2007-003) revealed an existing problem of the cabling in CO, telescope 1. Cables for column 3 and 4 of that camera were exchanged at the distribution board. The problem was fixed before the February 07 shift started.

Software progress

- The latest release of the firmware for the GPS clock is now also supported by the GPS server software. The software was extensively tested and extended by routines to parameterise the serial interface, the Lidar frequencies and other initial values from init files. This will solve also known problems found at start-up after power cuts.
- The new release of the DAQ software (FD-DAS 3.1.3-5) was finished after intensive tests with the system in Karlsruhe over a longer period. It will be installed in LA first, but after passing more tests then also in the other buildings. The new release is based on the latest FDEventLib V4R4, which was necessary for some extensions of the T3 trigger. It works together with the latest GPS server and interprets the external trigger as a flag for an external light source. Multiple light sources can be distinguished by their GPS sub-second time.
- A new version of the FD event display improves the interface to ROOT and works with the latest FDEventLib V4R4. Many small bugs were found and fixed by S. BenZwi.

R&D for Auger North and the HEAT proposal

- The PCB layout for the new SLT is in development and close to termination. All components are ordered, many are already procured.
- The circuit diagram for new FLT is finished. Its PCB layout will follow the SLT one.
- The design of a new AB will be discussed at the upcoming Auger North workshop in February.

WBS 2.1 SD (Ingo Allekote – Instituto Balseiro)

The assembly and deployment numbers corresponding to the period December 2006 - January 2007 are:

- Tanks received and inspected in Malargue: 60
- Detectors assembled: 16
- Detectors positioned: 60
- Detectors filled with water: 39
- E-kits installed: 88

As of December 31st, 2006, we had:

- Total SD in the field: 1238
- Total SD with water: 1215
- Total SD with e-kit: 1093

During the full year 2006, the following assembly and deployment activities were accomplished:

- Tanks received and inspected in Malargue: 363
- Detectors assembled: 146, plus 165 without PMTs
- Detectors positioned: 161
- Detectors filled with water: 172
- E-kits installed: 171

At the end of November 2006, the Auger Project was granted access to the land of Villar, in the central northern part of the array. With the help of the front loader and trucks from CNEA, roads were cleared in this land to satisfy the requirements imposed by the landowner.

The main access road to the central-northern part of the array, just east of the Villar land, presents a segment of very sandy soil, which was difficult to transit even with light vehicles. This access road was considerably improved, with the addition of large quantities of gravel. As a result, the central part of the array, including the XLF position, is expected to be well accessible all year long.

Deployment in the Villar land started in December 2006. After coming to a halt at the end of 2006 (due to lack of silicone for potting the required PMTs), the deployment activities resumed in January 2007 and as of February 20, only 16 out of the 85 detectors need to be positioned and filled with water.

Due to an error in the survey of the positions, 26 of these detectors are displaced by 110-120 meters to the NW from their theoretical positions.

The water delivery was improved by mounting the two water transport tanks that used to be mounted on trailers (Tk-alfa and Tk-delta) on a single flatbed. This way, a hired truck pulls the two water loads along the paved road much faster and more efficiently than the Fiat trucks from CNEA, saving gasoline and delivery time. The water is transferred in the field to the CNEA trucks that do the cross-country transport and final filling.

With the help of the maintenance technicians, 3 detectors were placed in a region of very difficult access, between the Lechuzo and Atuel rivers.

After a brief delay due to minor bureaucratic difficulties with funding in Brazil and with import waivers, production of tanks has resumed at Rotoplastyc in Carazinho, Brazil. As of February 7, Rotoplastyc had 49 tanks ready for shipment to Malargue and was producing two more per day. There were approximately 1545 tanks in Malargue at that time. There is resin and funding for Rotoplastyc to produce approximately 94 tanks more for a total of approximately 1688 tanks.

Rotoplastyc continues to test the foaming resin of interest for thermal insulation for Auger North. They have been concentrating on a foaming resin made in Sao Paulo of density between 1/6 and 1/8 that of the normal solid resin. The latest small test tank appears to be quite successful with a foam thickness greater than 50 mm. This tank is shown in the figures. More of this resin has been compounded (the resin company ran out of an imported chemical required

and a delay in making more resin resulted) and Rotoplastyc will now see if they can reproduce this success. If so, a full-size tank will be attempted.

WBS 2.2 Surface Detector Electronics (Tiina Suominen – IPN Orsay)

There are currently more than 1360 Ekits assembled. The assembly rate is fixed to 60 Ekits/month. A major effort was recently done to reorganize better and clean the SDE-Fabrica.

There are about 600 UBs with 500 mA fuses that need to be changed to 750 mA fuses in the field. It is estimated (by Ricardo Sato) that about 3-4 500 mA fuses per week become critical and need to be replaced. Until now the fuses were changed only in the SDE-Fabrica. With the new truck having a large cabinet the fuses can be changed in the field. The time needed to change a fuse is about 10 min (this does not include removing the Ekit and installing it again after the fuse change). From now on, it is recommended that the fuses are changed in the field (following the procedure given by Bernard Courty and Stephane Colonges). This avoids the transportation of Ekits to the SDE-Fabrica.

40 extra PMTs were ordered from Photonis. There are not enough bases for these PMTs. More bases will be fabricated in Italy (by NEOM). Cables and HV modules were ordered by US. These orders have not arrived yet to the base fabricant.

3 shipments of 60 PMTs from the batch of 240 extra PMTs have arrived to Malargue. In one of them there are PMTs without bases. The plan is to solder the bases to the PMTs in Malargue.

To increase the quality of the potting, several actions were defined during the November meeting, in particular, to make a clean room for the PMT potting area to avoid dust getting into the potting. The clean room is now ready (except that the air filtering system will still be installed in a couple of days).

Also the potting procedure has been revised with particular care on properly cleaning the bases before potting and making sure that the bases are well potted also underneath. The revised procedure is available in Spanish and will be soon translated to English.

The potting with the new procedure in the clean room started a few days ago. The quality of the potting (visual inspection) is now good (much better than before).

All the PMTs will go to deployment, only a small batch of about 10 PMTs will be kept for the maintenance purposes. There are currently about 150 assembled tanks in the AB yard without PMTs (due to stopping of the PMT potting because of the PMT instabilities, see previous notes). These tanks are now transferred to the AB assembly hall for PMT installation and then deployed to the field.

Some SD technicians have been trained to deploy Ekits. This deployment consists only of connecting the Ekit. All the tests will be done by from CDAS (by Ricardo Sato).

Another SDE technician should urgently be trained to help Fabian Lemos with the SDE maintenance and other activities. Unfortunately Javier Alcaya will still be for some time on leave after the November incident.

WBS 4.0 Online Monitoring (Cyril Lachaud – APC)

Here follows the Report concerning the Auger Monitoring Task.

The monitoring server in development is available at: <http://moni.auger.org.ar/dev>.

While it is in development it allows already to get information's and more important to get some feedback from the users. So do not hesitate to contact us...

To browse the Graphical User Interface you need now to create a login (Frédéric Melot).

The SQL Databases are replicated to the Wuppertal development server, and the web interface is available at:

<http://fdmondev.dev.uni-wuppertal.de/daily/AugerMonitoring/WebSite/> (Julian Rautenberg).

All the alarms written in the wiki by experts for the SD

(<http://wiki.auger.org.ar/doku.php?id=monitoring:shifter:alarmlist>) have been implemented (Corinne Berat and Anne Stutz from Grenoble). We need experts to write new alarms in the wiki. The alarms displayed on the GUI randomly are now working properly (but it concerns mostly SD for the moment).

The T2 information is available in almost-real time (Benoît Revenu). The information is directly extracted from the "seconds" file filled by Ct each second in the CDAS.

Two alarms with "Extreme" levels have been added (Huge LS Loss when 20 LS disappears in one second, NoT2ReceivedByCt when no information is written anymore by Ct in the "seconds" file).

The PMS (Parts Management System) is available on moni.auger.org.ar in real time through a master-slave replication from muon.auger.org.ar thanks to Ruben Squartini.

To finish FD is ready to get data from the last eye since it collects data (Kai Daumiller, Hermann-Joseph Mathes...).

A workshop for the developers will be held in Paris between the 26/03 and 30/03.

<http://apcauger.in2p3.fr/Protected/AugerMonitoringWorkshop/index.php>

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

Since the release of v2.2, the core framework has undergone a number of revisions intended to simplify code maintenance and development. The data manager mechanism was significantly reorganized, and new functionality was added to allow for better evaluation and optimization of database usage. A new manager for fetching FD uptimes has been added to the manager registry. A centralized random number engine has been implemented, which will ensure simulation runs can be exactly reproduced and tested. A new database mirror has come on-line at University of Nova Gorica, and a new builder from UCLA has been added to the buildfarm.

A large scale hybrid simulation production campaign is now underway. In the course of this work, a number of rarely occurring bugs were uncovered and dealt with.

A method for speeding up simulation of stations close to the core has been implemented on an experimental branch. Results from this approach are now being evaluated, and if they prove to be valid, SD simulation time will be significantly reduced.

New FD simulation modules have been developed which generate photons at the diaphragm, coming from either showers or the calibration drum. This approach allows swapping the existing KG telescope simulator more easily with, for example, a Geant4 based simulation.

The Offline team is working to have a new release ready as soon as possible.

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

Only minor problems during December and January. Data taking was smooth, except for some bad weather.

The emergency exit in Los Morados was found open. There were no signs of anyone who tried to enter the building. It was probably just left open by accident.

All FD cameras were taken to Loma Amarilla and their assembly finished. They are right now being aligned.

Radio Detection R&D – (Ad Van de Berg – KVI)

The radio R&D setup near the CLF system has been running without interruption from end of November 2006 to end of January 2007, when a first intervention has been made to eliminate the source of noise identified as the main problem. At the end of January the DC-DC converter was identified as a source of huge transients. Therefore, it was replaced by a radio-quiet converter, which indeed improved the situation regarding the radio frequency interferences. Evolution of trigger rate as a function of time is under study. Actual noise sources are not yet all identified, but it is likely that one of them comes from the system itself, though it is much less important now. Other transients have been identified as far storms, with very characteristic signal waveforms. During stormy conditions, even if the storm is very far from the site (beyond the

mountains, more than 100 km away), trigger rate rises up to the limit and most signals are saturated with the current DAQ settings. This is a very important fact that has to be taken into account for further array design: storms are very well “seen” by the antennas. Until now very few good data have been obtained.

Near the BLS, the team from the Netherlands dismantled the set up in early December, to make place for other tests scheduled in early spring 2007. Otherwise, no onsite work was done during the period. The groups are analyzing the data from September until December 2006, and are optimizing the current setups concerning trigger and communication systems.