

Pierre Auger Project

Progress Report

Summary (photo album)

The important news this month is that we have obtained an agreement for access to Felix/Sat land for deployment of surface detector stations. Over the next few weeks this large hole in the array immediately in front of the Coihueco fluorescence building will be closed up. Survey for tank positions is underway. The staff has made excellent progress installing and filling detector tanks in the eastern part of the array including difficult areas that are normally too wet to access.

The last of the tanks are arriving from Brazil. Stations will be assembled and moved to the Felix/Sat locations over the coming weeks. Problems with the quantity and quality of batteries have delayed the installation of the power and electronics for more than 80 tanks already filled with water.

Two of the three foundations for the HEAT telescope enclosures have been finished. In early February the installation of the ground plates and tilting mechanics will start. Electronic components for the Heat telescopes are being completed and will be shipped to the site from Germany in February. Good progress is also being made on components for the AMIGA array.

The design for the Auger North detector continues to evolve in preparation for submission of funding proposals toward the end of 2008. A symposium entitled *International Astroparticle Physics Symposium* is being planned for 6-8 May in Golden, Colorado. One of the goals of the symposium is to discuss plans for the future of cosmic ray physics at the highest energies.

WBS 1.1.3 Fluorescence Detector Calibration (Jeff Brack – Colorado State)

Recent progress on FD calibration has focused on the relative calibration data analysis with the goal of filling the offline database with nightly calibration constants. The main data analysis effort is now centered in Catania. All calibration data from the calA fiber for 2007 have now been analyzed. The Prague group is now working on analysis of calB/C data.

Work continues on defining early epochs for the calibration database (CSU and Malargue), and on construction of software machinery for auto loading the nightly database once it is ready (UNM). A model of FD PMT response as a function of time has been developed (Rome2) and has recently been improved to include events from the monitoring database such as shutter doors opening/closing, HV on/off and the effects of cloud cover on night sky background. With adjustment of parameters, the model can track the observed PMT degradation over time.

Plans for moving the Malargue FD calibration lab into the AB are still in flux. The small AB dark room will be used for lab space. One configuration being considered for drum calibration is to build a permanent dark room inside the AB hall, covering nearly half the hall floor.

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

DAQ software (H.J. Mathes, M. Sutter)

- Currently a lot of time is spent for tests and reorganisation of the DAQ software. Unfortunately, automatic file transfer from FD computers to Karlsruhe via cronjobs is practically impossible as the job aborts at an early stage. Ruben is aware of the problem, but it's not yet solved.
- Nevertheless the FD-DAQ version 3.3.2-4 was installed for the (current) February 08 shift. This new version allows setting the parameters of the TLT algorithm via ini-files and logs the settings in the monitoring database. It is accompanied by the new FDEventLib version v3r5; version v3r6 is under preparation together with the corresponding IoFD v3r6 (holding routines to read/write events).
- A new GUI to operate the DAQ is under development by M. Sutter as part of the Auger ACCESS project. Interfaces to the DAQ software have been defined and the new GUI will allow steering of all buildings simultaneously.

Other software (A. Kopmann)

- The recording of statistical data (variances, pedestal, hitrate, and threshold) with the command 'bgrecord' was revised and debugged. The operation is now more stable and the writing of pedestal values in the monitoring database is now correct (before a constant value of 150 was written).
- There is now a library of LabView functions available to access the Pbus class. This eases the programming of software for hardware tests using LabView.

R&D for HEAT (and Auger North)

- The component to steer the shutter, the fail-safe curtain and other sensors/actors of one telescope have been consolidated for the first time in a single control box (see photo). The new design by N. Barenthien saves a considerable amount of material and thus reduces production costs assembling time. The boxes and other mechanical parts for HEAT will be shipped by sea cargo from Karlsruhe end of February 08.
- The development and production of components for HEAT electronics proceeded. The current status is:
 - One SLT of the final design (version 4.1) is assembled and completely tested, i.e. the interfaces between the FPGA and all periphery (memories, backplane buses, PCI, PrPMC module) are verified to work. As soon as time permits the IPE fabrication center will assemble 7 more units, which will be used by the KATRIN and the USCT project, too.
 - 10 PrPMC computers PSL09 have been procured and tested successfully.
 - A revised FLT circuit diagram (version 4.1) is completed, but the changes have not yet been incorporated into a new FLT PCB layout. In parallel to the PCB work the components are currently procured (main parts have already been delivered) and the firmware is developed.

- F. Guarino (INFN Napoli) and his colleagues have finalized the design of the HEAT analog board. Four prototype boards with two different bandwidth (3 and 6 MHz) will be available within the first week of February to measure the performance (linearity, bandwidth, cross talk and functionality). The group has also developed a test board which allows to set the gain for normal and virtual channels and to inject input signals to predefined channels. Our goal is to carry out an integration test of AB and FLT beginning of March in Karlsruhe.

WBS 2.1 SD (Ingo Allekote – CNEA)

Delivery of tanks from Rotoplastyc in Brazil resumed in November after a long hiatus due to Brazilian funding delays and difficulties with the trucking company, and 54 tanks were delivered to Malargue before the holidays. Unfortunately, the Brazilian trucking company did not get the highway permits for any deliveries after the holidays and failed to deliver any more tanks after the original 54 through the end of January. As a result, assembly and deployment of surface detectors stopped when the existing supply of tanks ran out. The first delivery in 2008 is expected to arrive in Malargue in the second week of February. (All the tanks have been made. The problems have simply been with the delivery.)

Development of foam-insulated tanks for possible use in Auger North has been slow at Rotoplastyc. It is believed that the variable quality of the foaming resin available in Brazil has been part of the problem with the inconsistent results produced by the tank development work. A shipment of foaming resin from A. Schulman Inc., the company that produced the high quality resin used for nearly all of the SD tanks, was sent to Rotoplastyc and tests with the small mold and the Schulman foaming resin have begun. An even smaller mold, enabling tests to be made with the use of even less resin per test, has been built.

Development of foam-insulated tanks by the Rotoplas company in Mexico has begun to make progress. So far, they have made test tanks in three sizes with three different molds. Two of the three had good results, and the third (and largest at 155 cm) test was not successful. They are continuing their development work.

A company in the US has made a proposal for development work to develop the foam-insulated tank technology. Although the proposal is quite interesting, any contract with this company will have to wait for funding in the United States, and perhaps for a more formal solicitation for proposals from other companies.

The basic facts for the period Dec 2007 - Jan 2008:

Tanks arrived: 18

Detectors assembled: 38

Detectors deployed: 38

Detectors filled: 55

E-kits installed: 17

As of December 31, 2007, there were:

detectors in the field: 1589

detectors with water: 1540
detectors with electronics: 1475 (according to Little Brother)

As of January 31st, 2008, there were:
detectors in the field: 1597
detectors with water: 1570
detectors with electronics: 1481 (according to Little Brother)

Batteries are a continuing problem. Although a batch of 100 additional batteries have been purchased in december, these were not delivered until the beginning of February 2008, thus delaying the electronics deployment and the entering operation of many tanks in the northeastern part of the array. Recently received shipments still show a high rate of batteries failing to pass the initial quality tests.

Deployment of the detector tanks that were received at the end of 2007 continued both in the land of the Italians as well as in two portions of land south of it, next to the Atuel River. Although it costed a huge effort to reach this difficult area, most of the tanks were filled with water.

Access to the land owned by Felix and rented by Sat has finally been granted to Auger! This is basically the last portion of large land where an agreement with landowners was pending resolution. Access to Felix/sat will allow to fill the last big hole in the array. Tanks are expected to be deployed in this area starting in February, soon after the next tank shipment arrives.

WBS 3.0 Comms (Jorge Abraham – UTN)

- AntennaKits mounted: 1569.

(See Image: AntennaKitsDply.JPG. Green and Blue SD have AntennaKits Installed).

- AntennaKits made: 1660. We finish this part of Task !!!!! Reported in my last Bi monthly report.

- I make a control periodic of the SD Signal quality.(See Image: SU-Signal.JPG).

About bad links, We will change some AntennaKits for High-Gain Antenna Kit to solve the problems. May be during the first six month from 2008.

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

Extensive tests are currently being performed on the new SdCalibrator module. The next release is on hold until these are finalized.

New external package distribution kits are being prepared for the release.

A prototype CMake build system is in ongoing development. This system should allow for easier maintenance of the build for the growing Offline system.

The buildfarm has been substantially upgraded, and now includes (among other features) a build on mac OSX.

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

The FD data taking continued without major problems. Only weather, power cuts and minor failures prevented normal operation in very few occasions.

Relative calibration analysis is being performed in the calib PC in Malargüe in order to reduce transfer delays and impact on the bandwidth of the link. Further analysis will be performed locally one the system shows is tested.

The monitoring part of the FD is getting more robust as more shifters are using it. The diagnosis of the calibration runs will be performed directly in the monitoring system to let the shifters troubleshoot the system.

Primo installed a light sensor in bay 5 in Los Leones, this is a first prototype but future improvements could allow us to know when it's time to open the shutters again if the cameras have seen too much light.

WBS 9.0 Observatory Operations cont. – (Ricardo Sato – Southern Observatory)

In this particular period of the year, the problems are mainly related with storms. The main problem generated by storms is power cut mainly in the Los Leone and Los Morados buildings.

On Dec. 26th, 2007 for example, we lost about half of all array because a power cut happened two days before. This particular problem has been fixed only on Jan 2nd, 2008. It happened because the problem was not just a blown fuse, but some problem related with power line Los Leones - Los Morados.

Beside the power cut problem, there is another one which looks to be related with one GPS in one uLSx which controls communication of BSUs 11, 12 and 13. It make the stations close to the Los Leones tower not connect just after the power come back and is necessary to someone goes to Los Leones building to fix the problem. This particular problem happened in the last three disconnections happened due to power cuts at Los Leones building.

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

- The radio R&D setup near the CLF system has been used to identify for the first time self-triggered events. It was discovered that for the GPS used by the UB the nanosecond time had not been correct. This error has been fixed and the old data set has been reanalyzed. In the time period from mid-July to mid-November 4 events have been detected in coincidence between SD and 1 antenna; 1 event in coincidence between SD and 2 antennas.

- A workshop has been organized in December at Wuppertal by Julian Rautenberg to discuss the various analysis methods of radio detection of cosmic rays at various European sites. The aim of this workshop is to streamline the software required for analysis and to exchange information regarding data analysis. Tim Huege has released the REAS code, which can be used to simulate radio signals coming from EAS. Stefan Fliescher has developed an end-to-end simulation using simulated events and various detector systems.
- New systems are being developed and tested in Europe (France, Germany, the Netherlands) leading to the use of new self-trigger concepts, which are presently being tested at the European sites. Furthermore, RWTH Aachen has designed and constructed a new LPDA-type of antenna. In the first half of 2008 tests with the new hardware and software will be continued at Auger South.
- An Auger Radio R&D Workshop has been organized by Richard Dallier at the Ecole des Mines in Nantes on 14th and 15th of January.

HEAT enhancement -Hans Klages (FZK)

The HEAT site preparation is making good progress. In January, two of the three foundations for the telescope enclosures (pits) have been finished.

In pit no.3 the concrete will be poured in the first days of February. The site preparation work is ahead of schedule by about one week.

At the time of the collaboration meeting the installation of the ground plates and tilting mechanics will commence.

Visitors are welcome - helpers even more.

AMIGA - Alberto Etchegoyen

AMIGA is ordering the first full electronics prototype boards and the FPGA programming is fairly advanced. Forty 64-pixel PMTs with resistor chains and HV supplies have been ordered. At the beginning of February, the new AMIGA WiFi system will be installed to the BATATA three tanks with a Coihueco access point. It will be a bidirectional system with the Central Station.

