

VATLY NEWSLETTER

CONTENT

With this second delivery of the VATLY NEWSLETTER allow us to wish you all a happy and healthy year of the Monkey! And thank you for your encouragements in pursuing the publication of this leaflet!

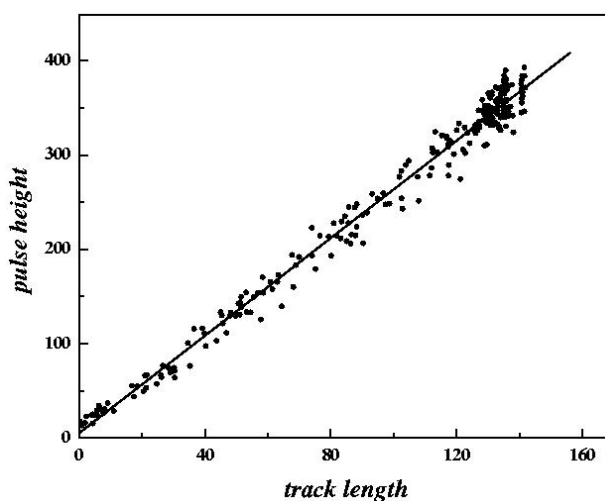
The present issue starts with some NEWS from the Laboratory. Dinh, who left for Michigan State University where he studies for a PhD, remembers of his three months stay at the Pierre Auger Observatory in MALARGÜE. The younger members of the VATLY group asked Thuan to tell them about INST, the Institute of Nuclear Science and Technology in the premises of which the Laboratory is installed. Diep, Nhung and Thao report on the VSOP10 School in Hue that was attended by the whole group over New Year. The members of the Hanoi CLUB OF ASTRONOMY paid a visit to VATLY in January, Diep and Thao interviewed them about their activities.

NEWS FROM THE LABORATORY

Two of us left for the States as PhD students: Duong, who obtained his master degree from Ho Chi Minh City University on the work he did with us in 2003 is now in Brown University and Dinh, who obtained a fellowship from Michigan State University, is now there to study for his PhD. Huyen, who is completing her fourth year at the National University in Hanoi joined us for her diplom work. She is measuring the muon lifetime from decays occurring in the Auger water Cherenkov counter installed on the roof of the Laboratory.

After completion of the measurements of the cosmic muon flux¹ the telescope has been dismantled and the scintillators have been rearranged in the counting room located underneath the water Cherenkov counter. They are stacked in a movable assembly of two sets, two

meters apart vertically, each set being made of 16 squares ($20 \times 20 \text{ cm}^2$), thus allowing for an ensemble of 256 different cosmic muon “beams” that impinge on the Cherenkov tank at different impact points and with different incidence angles. They have been steadily operated since New Year and perform very well. Nhung has written a Monte Carlo simulation programme that fully characterizes each of the 256 “beams” separately (track length in the water tank, zenith angle and azimuth, etc).



The average Cherenkov signal (in ADC channels, summed over the three PMT's) is shown as a function of the average track length (in cm) in the water volume for each of the 256 “beams” separately.

At the same time the Cherenkov counter has been refurbished as it had not been operated for nearly two years. An important sedimentation of brown dirt (iron oxide) was observed on the bottom of the tank resulting in a serious deterioration of the quality of the Cherenkov signal. The water supply system was improved by adding another filtering stage. However it is still insufficient and regular cleaning operations are necessary (it should soon converge to a steady state of satisfactory quality). The PMT high voltage dividers (with the photocathode at ground) have been modified and the Cherenkov counter is now steadily operated after having fixed minor light leaks, shielded the cables from an important TV pick-up and installed added protection against rain and humidity. As an

¹ The paper reporting on the east-west asymmetry has now appeared in Nucl. Phys. B678 (2004) 3 and the paper on the dependence of the flux on atmospheric pressure and temperature has been accepted for publication in Communications in Physics.

illustration of its performance the dependence of pulse height (sum of the three PMT signals) on track length is shown in the figure above for each of the 256 “beams”. The muon to electron decay signal has been observed and is being used by Huyen to measure the muon lifetime using a time to amplitude converter and a multichannel analyser. It will be the subject of her diplom work and results will be reported in the next issue of the Newsletter.

Diep has written a program that successfully reconstructs the geometry of Auger air showers (impact on earth, direction of incidence and curvature of the shower disc). After having tested its performance on a simple Monte Carlo shower generator he is now using it on real Auger events and comparing the result with the official (CDAS) Auger reconstruction code. Much effort will be devoted by the group, and in particular by Diep, in April to learn how to work on real Auger events, including the FADC data that have been ignored until now.

Thao has been working on various things and is currently evaluating the effect of the Landau- Pomeranchuk- Migdal effect on ultra high energy showers (she was asked about this effect at a recent examination but did not know about it, so she is kind of getting even with it...).

The group is currently attending weekly lectures on nuclear structure by Dao Tien Khoa (at INST) and, starting in April, on particle physics by Pierre (at the Institute of Physics).

Scientific attachés from the French and US embassies visited the Laboratory in February, as did young members of the Hanoi Club of Astronomy (see below).

Pierre paid a visit of courtesy to the Rector of the Hanoi National University, asking for “advice and help in establishing a friendly, trusty, close and efficient relation between the University and VATLY”. This was quite a successful and positive contact that will result in a significant improvement of our relation with the University (this point will be addressed in the next issue).

Finally, and most importantly, Pierre joined the March Auger Collaboration meeting in Malargüe on the invitation of Jim Cronin and Alan Watson. This proved to be very useful in establishing close and friendly contacts with the members of the Collaboration and in getting clearer

ideas about the role that VATLY can play. It will be the subject of a report in the next issue of the Newsletter.

As far as publications are concerned a summary paper on our cosmic muon flux measurements is in preparation and will be submitted for publication in Communication in Physics. An abstract has been submitted to the forthcoming Vth international conference of the Rencontres du Viet Nam cycle to be held in Ha Noi in August 2004 (there will be in fact two simultaneous conferences, one on particle physics and one on astrophysics), Thieu will give the presentation in the parallel session.

PAO IS FAR FROM VATLY... BUT ALSO CLOSE TO IT

Pham Ngoc Dinh, who is studying for his PhD at Michigan State, remembers about his stay at the Pierre Auger Observatory

PAO, the Pierre Auger Observatory, is famous for two important features. First, for being named after the great scientist Pierre Auger who discovered extensive air showers back in 1938, and second for hosting the largest extensive air shower detector in the world. It combines two kinds of devices, an array of water Cherenkov counters that sample the particle density on ground and fluorescence detectors that track the cascade development in the atmosphere, both being equipped with state of the art instrumentation. Such a hybrid detector is a major progress with respect to its predecessors as the systematic uncertainties attached to the two types of measurements are very different and indeed somewhat complementary. This places the Auger observatory in a very good position to solve the puzzle of the origin of the highest energy cosmic rays – where do they come from and which kind of mechanism can accelerate them to such extreme values?

The Auger Observatory is under construction in Argentina's Mendoza Province. I arrived there two years ago with my friend Phuong. It was our fist journey outside Vietnam and it took us to the other side of the earth! I was quite surprised, when we arrived in Buenos Aires, that the custom officers knew about the Pierre Auger Observatory, they very kindly helped us to find our way to Malargue. And when we arrived in

Mendoza we were welcome with a free beer that the local people offer to Auger members when they arrive.

We had planned to spend three months in Malargue but we lost a week to reach there. The time we spent over there was really extremely useful for us, we had enough time to become familiar with many of the latest techniques used for the detection of the highest energy cosmic rays. In particular, the week we spent with the school of the Center of Data Acquisition and Surface Detector Electronics, CDAS/SDE, gave us a good broad knowledge of many of the tasks in the experiment. Moreover we had great time joining various groups and working with them on concrete problems or running some experiments.



April 2002: The **VATLY** tank has just been installed on the Malargue site. Standing in front of it are **Phuong** and **Dinh** (at the extreme right) together with their colleagues from AUGER installation team.

Working conditions in PAO were just as tough as they were in VATLY with our training bench. In Malargue we had to fight a thin layer of dirt on top of the water surface. Indeed, at the collaboration meeting, a collaborator from France had shown how the quality of the signal depends on the quality of water inside the tank and such a layer was clearly undesirable. In VATLY, we were used to that kind of problem as we had been using water from the city distribution network rather than deionized water. Although we had passed it through filters it had not been sufficient to prevent microparticles to reach into the tank and slowly deposit on the bottom, building up a thin brown layer that absorbs light. So we were used to check the quality of the water...

Retrospectively, I regret that we did not spend more time, while in PAO, to learn about the analysis of the data in order to transfer that knowledge back to VATLY. We spent instead time working on a file of the station history that did not teach us very much. We enjoyed sharing the general excitement the day an eleven-fold coincidence event occurred. But some stations had gone down automatically and woke up without the control from the CDAS center, so we lost the data from some stations, then we realized that the high trigger rate had taken place at this very moment. That kind of experience also I had had in VATLY with our CAMAC controller that was hanging up when the rate was too high. This was the second time we could make use of our VATLY experience to help understanding the problem... What we also did was to join the effort to install six preproduction water Cherenkov tanks. One of them was named VATLY, we were very proud of it, and it performed quite well, the best of that batch of six, as was reported by John Harton at the collaboration meeting.

The Pierre Auger Observatory is really a very quiet place but when the collaboration meeting took place, with about 200 physicists rushing in from 19 countries all around the world, it suddenly became very lively! It was the first time for us that we had opportunity to participate in such a huge meeting. It gave us an idea of what the world scientific community really means, working together to solve the puzzles and fill in the white pages of physics.

In conclusion, it really has been great for us to have the opportunity to spend time in the Auger southern site and it made us understand how useful it had been to be trained in VATLY before climbing on board.

THE INSTITUTE FOR NUCLEAR SCIENCE AND TECHNOLOGY (INST)

The younger members of the group asked Dr Vo Van Thuan, the Head of the Institute that hosts VATLY, to tell them about it.

VATLY: Could you tell us briefly about the history of our Institute?

Thuan: It was created by decision of the Prime Minister on January 21st 1991 and registered with the International Atomic Energy Agency

(IAEA) as a key institution for R&D in nuclear science in Vietnam. It included four departments: Nuclear power plant studies, Isotope and radiation applications, Radiation technology, Radiation protection and Basic research and computing.

VATLY: What are its main activities?

Thuan: As its name says, INST does basic research as well as applied research in nuclear science and technology. Priority is on activities implying the use of radioactive isotopes and of nuclear radiations. The main and most important task, as given to us by our government, is to acquire expertise in radiation protection in preparation for the introduction of nuclear power plants in Vietnam. Other tasks are in relation with other fields such as medicine, industry, environmental preservation, agriculture, biology, etc. The irradiation centre studies and develops irradiation processing techniques for the sterilization of food and of medical products. As applied research requires the same rigour and the same methodology as fundamental research we train students in the latter at undergraduate, graduate and postdoctoral levels.

VATLY: Beside these general tasks, could you give us more detailed information on the fundamental research programme of INST, that we are most interested in?

Thuan: In parallel with our applied physics activities we do some fundamental research in nuclear and particle physics. As Vietnam operates no particle accelerator, this must be limited to domains that do not require such tools. In practice we pursue two lines of research. One is theory, including field theory in contact with other groups at the Institute of Physics and at the National University, and nuclear theory, mostly on nuclei far from stability. Contacts with foreign accelerator laboratories such as RIKEN (Japan), GANIL (Caen, France) and GSI (Darmstadt, Germany) make it possible for our students to spend some time over there. The second line of research is at the high energy frontier and you know it well: VATLY. It is a laboratory providing training in particle physics and astrophysics and having as an aim the creation of a group of experimenters working in the framework of the Pierre Auger Observatory as full members of the collaboration. In these fields, there are only very few other places in Vietnam where one does fundamental research. At Ho Chi Minh City there is some effort to develop research in particle physics but they have

no installation at home, they send students abroad to be trained in large experiments such as D0 at Fermilab. Some other Vietnamese universities and the Institute of Physics do some sparse research in nuclear science at low energies. But INST is unique in Vietnam in hosting a laboratory of cosmic ray research.

VATLY: Is our Institute implied in accelerator or reactor projects?

Thuan: As you know, apart from a low power research reactor at the Dalat Nuclear Research Institute, Vietnam has no nuclear reactor. Studies have made it clear that nuclear power plants will be needed to sustain the development of the country. Nuclear electricity is meant to be produced in 2017 for the first time. But we are only at the planning stage for the time being and it is in this framework that we have a group that carries out calculations in reactor physics and works on nuclear safety assessment. Concerning accelerators, we have made several proposals, one was to improve the reliability and performance of the use of LINACs for cancer therapy, and another was to construct a medium energy cyclotron. The latter could provide precious training to our students not only in nuclear physics but also, most importantly, in accelerator physics and in related techniques such as vacuum, radiofrequency, high voltage, magnets, controls, etc.

VATLY: How does our Institute integrate in the academic scene of the country, which kind of diplomas and qualifications can it give to its students?

Thuan: INST works in collaboration with universities where some of our staffs give lectures on topics on which they have expertise. We welcome fourth year university students to do their diplom with us. We also can deliver a doctor degree in nuclear physics and theoretical physics. Training towards a master degree cannot be made at the Institute in isolation but requires taking courses at the university. We are working toward a closer collaboration between INST and university in this domain, making it easier for our physicists to follow such a programme.

VATLY: Could you say a few words about the contract policy?

Thuan: There are three kinds of staff contracts. Permanent staff, a hundred or so in total, fixed-term staff employed on long term contracts, forty in total, and finally thirty or so people employed on short-term contracts, usually in

relation with a well defined task having a limited extension in time. We are currently working on the implementation of a new staff policy, with the permanent staff being replaced by long-term contracts that should make staff management more flexible and effective.

VATLY: What kind of international relations does INST maintain?

Thuan: We have excellent relations with several scientific institutions all over the world, in Japan, France, Germany, the United States, etc. This makes it possible for us to send young scientists to prestigious institutions and experiments where they can learn and work. Conversely we may call on foreign experts to teach and train our staff. Such help has been a very precious asset of our Institute. RIKEN helped us to create the library and, most importantly, the Computing Centre for Nuclear Science (CCNS). Together with JAERI (Japan) we have built a formation centre for students of experimental nuclear physics and nuclear technology where they get practical training. As you well know, CERN and experimental groups working at CERN have given us the instruments, detectors and electronics, that equip VATLY.

VATLY: Thank you very much for all these very interesting informations.

VSOP10, HUE

The whole group attended the tenth edition of the Vietnam School of Physics organized in Hue from 29th December 2003 to 9th January 2004 under the aegis of the Rencontres du Vietnam, Diep, Nhung and Thao report.

Over New Year we all went to Hue in order to attend VSOP10. Memories of useful lectures, good friends, wonderful landscape and excellent weather are what remains of it...

The Institute of Physics was responsible for the practical organization of the school. We were something like 45 students from various parts of Asia, China, Thailand, Taiwan, Malaysia, Nepal, Pakistan, India... and, by far the most numerous, Vietnam, the host country. The scope was broad. There were particularly interesting lectures on the standard model, on collider physics and on neutrino oscillations given respectively by G. Belanger (the only woman lecturer), R. Hirosky and M. Nakahata. There were also interesting lectures on solid state physics, quantum

cryptography and cosmology. All lectures were given by experts active in the field they were teaching.

In parallel with these useful lectures we enjoyed many entertaining and interesting activities such as discovering the beautiful sites of the ancient capital, paying a visit to a children Village or listening to traditional music on a boat sailing along Hue's river. This gave us an opportunity to establish closer contacts with our schoolmates and exchange information on our experiences as students.



The VSOP10 class in front of Hue university building.

The school also gave us a chance to make short presentations of our own research work in the form of miniseminars. We had to prepare them well, both content and form, in order to give a good talk and stick to the time. It was a good occasion to practice a skill that is so necessary in research, and also to practice our English, a notoriously weak point of Vietnamese students. As we spoke (and listened to) only English during the school we could make clear progress.

The school was a success. Everyone was pleased with the organization. When we had to leave at the end of the school we realized that we had woven close ties between each other. Ky and Patrick, the main organizers, appeared to us as the "older brother" and "father" of the school students.

THE HANOI CLUB OF ASTRONOMY

Following a visit of the Hanoi club of astronomy at VATLY, Diep and Thao took part in one of their weekly meetings and interviewed Phuong, the Head of the club. They report below.

Phuong is a former physics student of the Hanoi National University who graduated last year. We had known him for some years because he was kind of famous in the University for having a passion, not to say a freak, for astronomy. He is now a research assistant in the astrophysics department of the Hanoi University of education and a member of both the Physics and Astrophysics Associations of Vietnam. He wrote a book entitled "Space-time and event" that is widely known in Viet Nam and abroad as an excellent introduction to astronomy for the general public. He is slender, kind and generous. He is quite an outstanding character, to us he personifies the passion for, and dedication to science.

Diep and Thao: Hello, Phuong, please explain how you got the idea to create the club of astronomy in the National University and tell us about it.

Phuong: There had been a demand for such a club for a long time. Even before entering university I had dreams of a forum where I could exchange knowledge with other astronomy fans. During my second year at the university, in 2001, I got together some friends who were sharing the same interest with the idea to set up a club in the National University. It turned out that we ended up creating a physics club rather than an astronomy club, we could get more students interested that way and after all astrophysics is part of physics. It still exists, meeting once a week, and has been taken over by the younger generation when the founders graduated. However, with the continuous progress of space research and the unceasing announcement of fascinating news (the latest one being the successful exploration of planet Mars) more and more students got interested in astrophysics and astronomy and the need to create an independent club became obvious. It was born on November 2nd, 2003 under the aegis of the Astronomy Association of Vietnam. Membership was immediately very high, today it reaches one hundred or so. The club meets weekly on Sunday afternoons at the National University. Most members are students from the last year(s) of secondary school and the first two years of university, there are also some graduate students.

D and T: So, you wanted one club and ended up with two! Can you tell us how your club works?

Phuong: A typical agenda of our Sunday afternoon meetings goes as follows: First point is

"Scientific information". Any member is welcome to talk. Information covers any astronomy/astrophysics event that may have appeared during the week on the web, on radio or on television. Point two is "English for astrophysics". The idea is to review the main events in English and make the members of the club familiar with the astronomy/astrophysics English jargon. Documentation in Vietnamese is very sparse, the books that we receive from abroad or that we download from the web are usually written in English, therefore I thought it was a good idea to include such a point on the agenda. The last and main point is a seminar, either by one of us – it gives us a chance to improve our skills at making a presentation – or by an invited guest – it is not a problem to find a teacher who enjoys giving a talk. In addition we sometimes organize a picnic. We choose a clear day and go away from town to observe the sky without being disturbed by the city lights.



Phuong, the Head of the Astronomy Club is seen here with his two telescopes.

D and T: Talking about observation, which instruments do you have?

Phuong: Not much, just two telescopes, here are some pictures we took. The smaller one, 10mm in diameter, is a gift from a friend of mine. The larger one, a XIXEN 60mm in diameter, has just been sent to us from France by Prof. Nguyen Quang Rieu. I bought an old camera and we could take very clear pictures of Mars. Now that we have the larger telescope we are going to send the smaller one as a gift to Ho Chi Minh City. They also have an astronomy club over there but they are even poorer than we are, they don't have any instrument.

D and T: Could you tell us what are the main difficulties that you are meeting and also the most successful achievements?

Phuong: The main pleasure is to witness the passion of the youngsters for astronomy and cosmology. I really enjoy seeing our meetings host such an enthusiasm and eagerness to learn. Also we enjoy much moral support from our teachers, particularly from Prof. Pham Viet Trinh, the Head of the Astronomy Association of Viet Nam. He is now an old man and to show him that the club is working well is a way for us to express our gratitude and to make him a present. For what concerns difficulties, astronomy in Viet Nam is underdeveloped and it is therefore difficult to find people who have sufficient motivation and competence to make the club progress. We lack a

place of our own where we can meet on Sundays and we badly need more instruments and observation tools. We need money to pay the rent of our meeting places, to buy documentation in English, to organize seminars, etc.

D and T: A last question, what do you wish for your club?

Phuong: I wish the club can become a home for anyone who is eager to learn about astrophysics and give a boost this way to the development of astronomy in Viet Nam. I also would like to obtain some logistic and administrative support in order to help keeping the club alive and satisfying the needs of our members.

D and T: Thank you very much and our best wishes of success to you and your club!

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