Session PS7 : Particle Astrophysics, Cosmology

1- Gabriel Chardin, DAPNIA/SPP, CEA-Saclay, France.

Title: Direct Dark Matter search in the EDELWEISS experiment.

Abstract: The status of the EDELWEISS experiment is presented. Data takings realized with two cryogenic 70 g Germanium detectors tested in the setup designed for the "1 kg" stage of the experiment show an event rate before rejection of approx. 2 evt/kg/keV/day above E ¿ 20 keV, and 0.02 evt/kg/keV/day in the [50, 150] keV recoil energy interval after background discrimination. After optimization, these detectors should be able to test in a few months the entire region claimed by the DAMA experiment. We discuss the hypothesis that low energy surface nuclear recoils, which seem to have been unnoticed by previous WIMP searches, may provide an interpretation of the anomalous events recorded by the UKDMC and Saclay NaI experiments. The present analysis points to the necessity of taking into account surface nuclear and electron recoil interactions for a reliable estimate of background rejection factors. Finally, the status of the EDELWEISS-II experiment, which should start in 2001 and test a significant fraction of the SUSY parameter space using a 100 liter reversed cryostat of original design will be described.

2 Roger Clay, University of Adelaide, Australia.

Title: Galactic EeV Cosmic Radiation, Observations and Interpretation.

Abstract: EeV events which apparently originate in our galaxy have recently been reported by ground based cosmic ray air shower arrays. The basis for thesereports will be examined. Additionally, their astrophysical interpretation will be addressed and together with its implications for cosmic radiation at even higher energies.

3-Fabrice Feinstein, DAPNIA/SPP, CE Saclay, France.

Title: The ANTARES neutrino telescope.

Abstract: ANTARES (Astronomy with a Neutrino Telescope and Abyss environmental RESearch) is a European collaboration of particle physicists, astrophysicists and sea scientists, aiming at the construction in the coming three years of a high energy (above 10 GeV) neutrino telescope to be installed in the Mediterranean sea off the French coast, near Toulon. An array of photomultiplier tubes detects the Cherenkov light wave of the muon produced by the charged current interaction of the neutrino having occurred inside or near the instrumented volume. Neutrinos have the unique capability of carrying information out of regions of the Universe, either too dense or too far away for other high

energy particles to escape or to reach us before interacting with the intergalactic medium. Another source of neutrinos could be the annihilation or the decay of Weakly Interacting Massive Particles produced during the Big Bang and having accumulated in the centre of the earth or the sun or around the supermassive black hole which may lie in the Galactic centre. Atmospheric neutrinos produced by the interaction of primary cosmic rays in the upper atmosphere will be used to study neutrino oscillations.

4-Alejandro Gangui, DARC, Observatoire de Paris-Meudon, Paris, France.

Title: Best estimators for quantifying CMB non-Gaussianity.

Abstract: Typical signatures of non-Gaussianity in Cosmic Microwave Background maps are often tiny and hidden by systematics and foregrounds. We here present the best estimators to employ for recovering these signatures from present and future CMB maps.

5- John Matthews, University of Utah, Salt Lake City, UT, USA.

Title: First Results from the High Resolution Fly's Eye Experiment.

Abstract: The high resolution Fly's Eye experiment (HiRes) is the direct descendent of the original Fly's Eye experiment. It is designed to make stereo observations of Ultra High Energy Cosmics Rays (UHECR) via the atmospheric fluorescence technique. HiRes will measure the energy spectrum, composition, and anisotropy of UHECR. The first of two sites, the first site HiRes-I has been in observation since June 1977. Over 1000 hours of good weather, monocular data has been collected and analyzed. A preliminary energy spectrum is presented based on this data set and compared to the results from the original Fly's Eye experiment. The second site HiRes-II began limited data-taking in April 1999. The commissioning of the HiRes-II detector is now complete and normal data collection is underway. Some high energy events have already been observed in stereo.

6- Nguyen Tien Dung, Institute for Nuclear Science and Technique (INST), Hanoi, Vietnam.

Title: Towards a prototype of the Auger water Cerenkov detector in Vietnam (Nguyen Mau Chung (Hanoi University), P.Darriulat (CERN), Nguyen Tien Dung, Pham Ngoc Dinh, Nguyen Phuc, Pham Trung Phuong, Dang Quang Thieu and Vo Van Thuan (INST)).

Abstract: A test set-up is being assembled at the Institute for Nuclear Science and Technique (INST) with the aim of gaining experience with the operation and performance of water Cerenkov counters of a design similar to that used in the Auger experiment. Eighteen scintillator plates (120 x 40 x 3

cm 3) are used to provide a trigger on cosmic rays, allowing for the selection of specific events such as muons, showers, etc...

In a first phase a small Cerenkov counter of only 1000 litres is being studied, in a second phase a replica of the larger counter used in the Auger experiment will be constructed. The trigger electronics uses the NIM standard and the data acquisition system is CAMAC based. The set up will serve as a training bench for several of the techniques used in cosmic ray research, including online and offline analyses and Monte Carlo simulation. A brief status report will be presented.

7- Tran Dai Nghiep, Institute for Nuclear Science and Technique (INST), Hanoi, Vietnam.
Title: Development in Nuclear Astrophysics (Tran Dai Nghiep and Pham Ngoc Dinh (INST)).
Abstract: Recent development in nuclear astrophyics is briefly reviewed. The periodical activity of stellar systems like the Sun and Quasar OJ287 is studied. The nuclear methods are applied to approach astrophysical phenomena. The energy-transfer model and standard solar model are discussed.

8- Claudia Cecchi, INFN, Perugia, Italy.
Title: Study of the fluxes of trapped particles in Earth's magnetic field with the AMS experiment.
Abstract: The AMS experiment is a magnetic spectrometer designed to measure with good precision the composition of cosmic rays in the space. The experiment has collected about 100 Millions event during a first flight in 1998 on the shuttle Discovery, at the altitude of 380 Km and with an orbit inclination of 57 degrees with respect to the equatorial plane. We report on the results of the study on fluxes of trapped particles in the earth magnetic field, in particular on protons, electrons, positrons, deuterons and helium. The data have been analysed in term of adiabatic magnetic variables, using techniques of tracing in the earth magnetic field which allow to identify the production zones of such particles.

9- Jérome Martin, Observatoire de Paris-Meudon, Meudon, France.
Title: Cosmological implications of quintessence Abstract: In the context of quintessence, the concept of tracking solutions allows to address the fine-tuning and coincidence problems. When the field is on tracks today, one has $Q \approx m_{\rm Pl}$ demonstrating that, generically, any realistic model of quintessence must be based on supergravity. We construct the most simple model for which the scalar potential is positive. The scalar potential deduced from the supergravity model has the form $V(Q) = \frac{\Lambda^{4+\alpha}}{Q^\alpha} e^{\frac{\kappa}{2}Q^2}$. We show that despite the appearence of positive powers of the field, the coincidence problem is still solved. If $\alpha \geq 11$, the fine-tuning problem can be overcome. Moreover, due to the presence of the

exponential term, the value of the equation of state, ω_Q, is pushed towards the value -1 in contrast to the usual case for which it is difficult to go beyond $\omega_Q \approx -0.7$. For $\Omega_{\rm m} \approx 0.3$, the model presented here predicts $\omega_Q \approx -0.82$. Finally, we establish the $\Omega_{\rm m} - \omega_Q$ relation for this model.