ARENA 2010

Rapport sur les contributions

https://indico.in2p3.fr/e/2719

ID de Contribution: **0** Type: **oral presentation**

LUNASKA lunar Cherenkov observations: signal processing strategies

mercredi 30 juin 2010 18:30 (20 minutes)

The LUNASKA project employs the lunar Cherenkov technique, using the Moon as a detector volume to search for ultra-high energy particles. The radio-frequency pulse from a shower induced by one of these particles in the lunar regolith may be detected by a terrestrial radio telescope; however, it is distorted en route by dispersion in the ionosphere, as well as by effects within the telescope signal path related to downconversion and sampling. These effects reduce the sensitivity of this technique compared to its theoretical potential, but they can be largely compensated for by intelligent signal processing. We present a description of these effects and the approaches being used to nullify them, as well as latest results from our ongoing observations with the Parkes radio telescope.

Auteur principal: M. BRAY, Justin (University of Adelaide / Australia Telescope National Facility)

Co-auteurs: Dr PHILLIPS, Chris (Australia Telescope National Facility); Dr JAMES, Clancy (Radboud Universiteit Nijmegen); Dr ALVAREZ-MUNIZ, Jaime (University of Santiago de Compostela); Dr REYNOLDS, John (Australia Telescope National Facility); Dr ROBERTS, Paul (Australia Telescope National Facility); Prof. PROTHEROE, Ray (University of Adelaide); Dr MCFADDEN, Rebecca (University of Melbourne / Australia Telescope National Facility); Prof. EKERS, Ron (Australia Telescope National Facility / Curtin University)

Orateur: M. BRAY, Justin (University of Adelaide / Australia Telescope National Facility)

Classification de Session: Lunar Cerenkov detection

ID de Contribution: **1** Type: **Non spécifié**

On noise treatment in radio measurements of cosmic ray air showers

mardi 29 juin 2010 14:00 (20 minutes)

LOPES is an interferometric radio antenna array at the Karlsruhe Institute of Technology. It is triggered by KASCADE-Grande, and digitally measures the field strength of cosmic ray air shower induced radio pulses in the frequency range of 40-80 MHz. Due to the steep lateral distribution of the radio signal, its field strength often is - at least in some antennas - close to the noise level. Consequently, a correct treatment of the noise is of importance for the reconstruction of the lateral distribution, which is assumed to contain information about the primary energy and mass. Noise definitions applied so far, are originating from communication engineering. There, a signal usually has a power much larger than the noise, and lasts for a time significantly longer than its oscillation period, which is not true for air shower induced radio pulses. Hence, the noise has to be defined differently, and consistent with the definition of the radio pulse height (maximum of the field strength), e.g., to obtain a signal-to-noise ratio of 1 for vanishing pulse heights. Having such a consistent definition, the influence of noise has been studied with test pulses, allowing for a proper treatment of noise, even at low signal-to-noise ratios. Furthermore, the effect of noise on the slope of lateral distributions has been studied for LOPES events.

Auteur principal: M. SCHRÖDER, Frank (KIT)

Co-auteur: FOR THE LOPES COLLABORATION, - (-)

Orateur: M. SCHRÖDER, Frank (KIT)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **2** Type: **oral presentation**

Design of the LORD Space Experiment and Perspectives of Ultra High Energy Particles Observation

mercredi 30 juin 2010 18:50 (30 minutes)

The feasibility of using the lunar orbital radio detector (LORD) to detect radio signals from showers initiated by ultra high energy particles interacting with the lunar regolith is studied. The design of the LORD space apparatus is presented. The sophisticated simulation by the Monte Carlo method has shown the necessity to take into account the radio signal reflection from the lower Lunar regolith boundary. As a result, the increase of the observation efficiency of true events increases by several times. This fact greatly enhances the scientific potentiality of experiments with the lunar orbital radio detector.

Auteur principal: Dr GUSEV, German (Lebedev Physical Institute Russian Academy of Sciences)

Co-auteurs: Dr LOMONOSOV„ Boris (Lebedev Physical Institute Russian Academy of Sciences); Dr POLUKHINA, Natalya (Lebedev Physical Institute Russian Academy of Sciences); Dr CHECHIN, Valery (Lebedev Physical Institute Russian Academy of Sciences); Dr RYABOV, Vladimir (Lebedev Physical Institute Russian Academy of Sciences)

Orateur: Dr GUSEV, German (Lebedev Physical Institute Russian Academy of Sciences)

Classification de Session: Lunar Cerenkov detection

ID de Contribution: **3** Type: **Non spécifié**

Ice Targets in Solar System and Possibilities of Ultra High Energy Particles Exploration by the Radio Technique

mardi 29 juin 2010 14:00 (20 minutes)

The problems for registration of cosmic rays and neutrinos with the highest energies existing in Nature are considered. Perspectives to detect these particles by the radio method are discussed. Radio detectors apertures are calculated by the Monte Carlo simulation for space experiments, in which Moon and comparable-size ice satellites of planets in the Solar System are used as targets. The comparison for the apertures shows, that the Lunar target is the most promising for future experiments.

Auteur principal: Dr GUSEV, German (Lebedev Physical Institute Russian Academy of Sciences)

Co-auteurs: Dr LOMONOSOV, Boris (Lebedev Physical Institute Russian Academy of Sciences); Dr CHECHIN, Valery (Lebedev Physical Institute Russian Academy of Sciences); Dr RYABOV, Vladimir (Lebedev Physical Institute Russian Academy of Sciences)

Orateur: Dr GUSEV, German (Lebedev Physical Institute Russian Academy of Sciences)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **4** Type: **oral presentation**

Acoustic search for high-energy neutrinos in Lake Baikal: results and plans

vendredi 2 juillet 2010 09:00 (30 minutes)

We report the present status and perspectives of the feasibility study to detect cosmic neutrinos acoustically in Lake Baikal. The results of background studies are presented. It was shown that most of the detected neutrino-like pulses come from the lake surface. This fact has been used in project of an acoustic prototype detector that consists of compact modules with 4-channel antennas each, arranged above the Baikal Neutrino Telescope at shallow depths and "listens" the deep-water layers of the lake. The results of test experiments and of data taking with the detector are presented.

Auteur principal: Prof. BUDNEV, Nikolay (Irkutsk State University)

Co-auteurs: AVRORIN, Alexandr (Institute for Nuclear Research); DOROSHENKO, Alexandr (Institute for Nuclear Research); SHEIFLER, Alexandr (Institute for Nuclear Research); SHIROKOV, Alexandr (Skobeltsyn Institute of Nuclear Physics MSU); DYACHOK, Alexsey (Irkutsk State University); PAN'KOV, Alexsey (Irkutsk State University); ZAGORODNIKOV, Alexsey (Irkutsk State University); KLIMOV, Anatoliy (Kurchatov Institute); KULEPOV, Anatoliy (Nizhni Novgorod State Technical University); KOROBCHENKO, Andrey (Irkutsk State University); KOSHECHKIN, Andrey (Institute for Nuclear Research); PANFILOV, Andrey (Institute for Nuclear Research); KLABUKOV, Arkadiy (Institute for Nuclear Research); SHOIBONOV, Bair (Joint Institute for Nuclear Research); TARASHANSKY, Boris (Institute for Nuclear Research); SPIERING, Christian (DESY); BOGORODSKY, Denis (Irkutsk State University); KULESHOV, Denis (Institute for Nuclear Research); PETUKHOV, Dmitriy (Institute for Nuclear Research); MIDDELL, Eike (DESY); POPOVA, Elena (Irkutsk State University); OSIPOVA, Elionora (Skobeltsyn Institute of Nuclear Physics MSU); PLISKOVSKY, Evgeniy (Joint Institute for Nuclear Research); DOMOGATSKY, Grigoriy (Institute for Nuclear Research); BELOLAPTIKOV, Igor (Joint Institute for Nuclear Research); DANILCHENKO, Igor (Institute for Nuclear Research); PORTYANSKAYA, Inna (Irkutsk State University); DZHILKIBAEV, Jan-Arys (Institute for Nuclear Research); GOLUBKOV, Kiril (Institute for Nuclear Research); KONISCHEV, Konstantin (Joint Institute for Nuclear Research); KUZMICHEV, Leonid (Skobeltsyn Institute of Nuclear Physics MSU); PAN'KOV, Leonid (Irkutsk State University); MILENIN, Michail (Nizhni Novgorod State Technical University); ROZANOV, Michail (St.Petersburg State Marine University); GAPONENKO, Oleg (Institute for Nuclear Research); GRESS, Oleg (Irkutsk State University); GRISHIN, Oleg (Irkutsk State University); SUVOROVA, Olga (Institute for Nuclear Research); WISCHNEWSKI, Ralf (DESY); MIRGAZOV, Rashid (Skobeltsyn Institute of Nuclear Physics MSU); FIALKOVSKY, Stanislav (Nizhni Novgorod State Technical University); MIKHEYEV, Stanislav (Institute for Nuclear Research); GRESS, Tatjana (Irkutsk State University); RUBTZOV, Valeriy (Irkutsk State University); BALKANOV, Vasiliy (Institute for Nuclear Research); PROSIN, Vasiliy (Skobeltsyn Institute of Nuclear Physics MSU); AYNUTDINOV, Vladimir (Institute for Nuclear Research); LYASHUK, Vladimir (Institute for Nuclear Research); POLESCHUK, Vladimir (Institute for Nuclear Research); ZHUKOV, Vladimir (Institute for Nuclear Research)

Orateur: Prof. BUDNEV, Nikolay (Irkutsk State University)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **5** Type: **oral presentation**

Status and Recent Results of the South Pole Acoustic Test Setup

mercredi 30 juin 2010 11:10 (30 minutes)

The South Pole Acoustic Test Setup (SPATS) has been deployed to study the feasibility of acoustic neutrino detection in Antarctic ice around the South Pole. An array of four strings of sensors and transmitters, deployed in the upper 500 m of four IceCube boreholes, and a retrievable transmitter that can be used in the water filled holes before the installation of the IceCube optical strings are used to determine the ice acoustic parameters. These include the sound speed and its depth dependence, the attenuation length, the noise level, and the rate and nature of transient background sources in the relevant frequency range from 10 to 100 kHz. SPATS is operating successfully since January 2007 and has been able to measure or constrain all parameters.
We will present the latest results of SPATS and discuss their implications for future acoustic neutrino detection activities at South Pole.

Auteur principal: KARG, Timo (University of Wuppertal)

Orateur: KARG, Timo (University of Wuppertal)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **6** Type: **oral presentation**

Acoustic transient event reconstruction and sensitivity studies with the South Pole Acoustic Test Setup

mercredi 30 juin 2010 11:40 (20 minutes)

The South Pole Acoustic Test Setup (SPATS) consists of four strings, which are deployed in the upper 500 m of IceCube holes. Each string is instrumented with seven acoustic sensors and transmitters to study attenuation length, noise level, sound speed and transient acoustic events in the ice within the 10 to 100 kHz frequency range. Data taking and investigation of transient events started end of August 2008 and continues until now.
Applying an algorithm based on the solution of a GPS like equation system on the data, allows to reconstruct the source of acoustic signals in the antarctic ice with high precision. Thus, acoustic signals from re-freezing IceCube holes during the IceCube construction phases 11/08-02/09 and 11/09-02/10 are identified. These data allow us to verify functionality and sensitivity of the acoustic test detector and to investigate the background of possible high energetic neutrino signals in the ice.
Until now all detected acoustic events are associated with sources, where a clear connection to human activities at the South Pole is given. The investigation of the transient noise is used in simulation studies in the SPATS sensitive area outside IceCube. An effective volume is calculated from which a neutrino flux limit in reach for the SPATS is derived.

Auteur principal: Dr BERDERMANN, Jens (DESY)

Co-auteur: Dr NAHNHAUER, Rolf (DESY)

Orateur: Dr BERDERMANN, Jens (DESY)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **7** Type: **Non spécifié**

New limit on the flux of ultra-high energy neutrinos from lunar observations with the Westerbork Synthesis Radio Telescope.

mardi 29 juin 2010 14:00 (20 minutes)

When an ultra-high energy (E>10^20 eV) neutrino hits the moon an electromagnetic pulse is generated. The instantaneous power of the pulse is so strong that they can be detected on Earth. In this presentation the observations will be described using the Westerbork Synthesis Radio Telescope on the basis of which more constraining limit have been set for the flux of neutrinos with energies exceeding 10^23 eV.

Auteur principal: Prof. SCHOLTEN, Olaf (KVI, Univ. of Groningen)

Co-auteurs: DE BRUYN, A. G. (Kapneyn Institute & ASTRON, Netherlands); FALCKE, Heino (IMAPP, Nijmegen, The Netherlands); BACELAR, Jose (ASML, The Netherlands); SINGH, Kalpana (KVI, Groningen, The Netherlands); AL YAHYAOUI, R. (KVI, The Netherlands); STROM, R.G. (ASTRON & UvA, The Netherlands); BRAUN, Robert (CSIRO-ATNF, Australia); BUITINK, Stijn (LBL, Berkeley, USA)

Orateur: Prof. SCHOLTEN, Olaf (KVI, Univ. of Groningen)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **8** Type: **oral presentation**

Coherent radio-wave emission from extensive air showers.

mercredi 30 juin 2010 15:50 (30 minutes)

The general properties of coherent electromagnetic radiation from extensive air showers will be discussed. It will be shown how certain properties of the radio signal can be understood independent of the details of the model and how other aspects reflect properties of the shower that we want to determine. Most of the examples will be based on the Macroscopic GeoMagnetic Radiation model, motivated from the underlying microscopic picture.

Auteur principal: Prof. SCHOLTEN, Olaf (KVI, Univ. of Groningen)

Orateur: Prof. SCHOLTEN, Olaf (KVI, Univ. of Groningen)

Classification de Session: Cosmic ray radio decametric detection, signal nature and current experiments

ID de Contribution: **9** Type: **oral presentation**

Air Shower Measurements with LOFAR

mardi 29 juin 2010 17:00 (30 minutes)

LOFAR is a new radio telescope that is being built in the Netherlands. The core of LOFAR will have a high density of antennas, the central "superterp" with nearly 600 antennas on a circular area of about 400m diameter, and more stations close by. In addition, the calibration on multiple astronomical objects will give an excellent calibration with an expected phase error of less than 50 ps. Together this will give LOFAR a unique sensitivity for the study of the radio emission of single air showers.

LOFAR is currently being set up with more than half of the stations already in the field. At the same time we are working on a triggering system for air showers and other radio transients, and on the analysis pipeline to extract air shower parameters from the recorded waveform data.

Triggering on the radio emission from air showers means detecting a nano-second radio pulse and discriminating real events from radio interference. At LOFAR, we will search for pulses in the digital data stream and use pulse-shape parameters to discriminate real events from background. We will also have a small scintillator array to test and confirm the performance of the radio-only trigger and to provide additional measurements for the air shower reconstruction and analysis.

Auteurs principaux: Dr HORNEFFER, Andreas (Dep. Astrophysics, IMAPP, RU Nijmegen); M. CORSTANJE, Arthur (Dep. Astrophysics, IMAPP, RU Nijmegen)

Co-auteurs: Dr JAMES, Clancy W. (Dep. Astrophysics, IMAPP, RU Nijmegen); Dr FALCKE, Heino (Dep. Astrophysics, IMAPP, RU Nijmegen; ASTRON, Dwingeloo); Dr HOERANDEL, Joerg (Dep. Astrophysics, IMAPP, RU Nijmegen); Dr SINGH, Kalpana (Kernfysisch Versneller Instituut, Groningen); M. BAEHREN, Lars (Dep. Astrophysics, IMAPP, RU Nijmegen); Dr MEVIUS, Maaijke (Kernfysisch Versneller Instituut, Groningen); M. VAN DEN AKKER, Martin (Dep. Astrophysics, IMAPP, RU Nijmegen); Dr SCHOLTEN, Olaf (Kernfysisch Versneller Instituut, Groningen); M. TER VEEN, Sander (Dep. Astrophysics, IMAPP, RU Nijmegen); M. THOUDAM, Satyendra (Dep. Astrophysics, IMAPP, RU Nijmegen)

Orateur: Dr HORNEFFER, Andreas (Dep. Astrophysics, IMAPP, RU Nijmegen)

Classification de Session: From radioastronomy to high energy particles

ID de Contribution: **10** Type: **oral presentation**

Recent results of the Pierre Auger Observatory

jeudi 1 juillet 2010 09:00 (30 minutes)

The Pierre Auger Observatory measures extensive air showers induced by ultra high energy cosmic rays using a hybrid detector (fluorescence and surface detector). The Pierre Auger Observatory has been designed for a high statistics, full sky study of cosmic rays at the highest energies. Energy, arrival direction and mass composition measurements are investigated in order to illuminate the mysteries of the most energetic particles in nature. The southern part of the Observatory, completed in 2009, has been continuously taking data since 2004. The results based on this data set are presented. An overview of the anisotropies in the arrival directions of the ultra high energy cosmic rays will be given as well as an update of the energy spectrum and an update of the upper limit on the cosmic-ray photon fraction. The mass composition of the ultra high energy cosmic rays will be presented more in details based on the hybrid data set, currently amounting to almost four thousand events above 10^18eV.

Auteur principal: Dr CREUSOT, Alexandre (University of Nova Gorica)

Orateur: Dr CREUSOT, Alexandre (University of Nova Gorica)

Classification de Session: Auger and the radio projects, reviews and results

ID de Contribution: **11** Type: **oral presentation**

Status and Recent Results of the Acoustic Neutrino Detection Test System AMADEUS

vendredi 2 juillet 2010 10:00 (30 minutes)

The AMADEUS system is an integral part of the ANTARES neutrino telescope in the Mediterranean Sea. The project aims at the investigation of techniques for acoustic neutrino detection in the deep sea. Installed at a depth of more than 2000m, the acoustic sensors of AMADEUS are based on piezo-ceramic elements for the broad-band recording of signals with frequencies ranging up to 125kHz.

AMADEUS was completed in May 2008 and comprises six “acoustic clusters”, each one holding six acoustic sensors that are arranged at distances of roughly 1m from each other. The clusters are installed with inter-spacings ranging from 15m to 340m.

Acoustic data are continuously acquired and processed at a computer cluster where online filter algorithms are applied to select a high-purity sample of neutrino-like signals. 1.6 TB of data were recorded in 2008 and 3.2 TB in 2009. In order to assess the background of neutrino-like signals in the deep sea, the characteristics of the ambient noise and transient signals have been investigated.

In the presentation, the AMADEUS system will be described and current results will be presented.

Auteur principal: Dr LAHMANN, Robert (University of Erlangen)

Orateur: Dr LAHMANN, Robert (University of Erlangen)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **12** Type: **oral presentation**

The lunar Cherenkov technique - answering the unanswered questions.

mardi 29 juin 2010 15:50 (30 minutes)

The lunar Cherenkov technique, by which (currently Earth-based) radio-telescopes observe the Moon to look for UHE cosmic ray and neutrino interactions in the lunar regolith, is a promising method for probing the very highest energy fluxes of these particles. However, predictions about the sensitivity of the technique tend to gloss over a number of important unknowns. How deep is the Moon's regolith, the nominal detection medium? Can we detect near-surface cascades (i.e. cosmic rays), or is the emission suppressed? What role does lunar surface roughness on both large and small scales play? In this talk I review these issues and their implication for detection experiments, and present the latest work to resolve (and in some cases, resolving) each of these issues.

Auteur principal: Dr JAMES, Clancy (Radboud University Nijmegen)

Co-auteurs: Prof. FALCKE, Heino (Radboud University Nijmegen); M. BRAY, Justin (University of Adelaide); Prof. PROTHEROE, Ray (University of Adelaide); M. TER VEEN, Sander (Radboud University Nijmegen)

Orateur: Dr JAMES, Clancy (Radboud University Nijmegen)

Classification de Session: Introductory talks

ID de Contribution: **13** Type: **oral presentation**

Detecting Ultra High Energy Neutrinos with LOFAR

mardi 29 juin 2010 17:30 (20 minutes)

When an ultra-high energy (UHE) neutrino hits the Moon, it initiates an hadronic cascade below the surface. The cascade has a negative charge excess that propagates faster than the local speed of light, producing a short pulse of radio Cherenkov emission. The NuMoon project aims to detect these lunar radio pulses on Earth with low frequency radio telescopes.
The Low Frequency Radio Array (LOFAR) is a large radiotelescope, with its core in the northern part of the Netherlands, that is currently being build. We are preparing to perform the lunar neutrino measurement with LOFAR. The expected sensitivity of LOFAR reaches flux limits within the range of some theoretical production models. I will discuss the challenges of detecting UHE neutrinos with LOFAR.

Auteur principal: Dr MEVIUS, maaijke (kvi)

Orateur: Dr MEVIUS, maaijke (kvi)

Classification de Session: From radioastronomy to high energy particles

ID de Contribution: **14** Type: **Non spécifié**

Research and calibration of Acoustic Sensors in ice within the SPATS (South Pole Acoustic Test Setup) project

mardi 29 juin 2010 14:00 (20 minutes)

We present the research activities for the feasibility of a large-scale acoustic detector for the detection of GZK neutrinos. Once this flux characterized, insights into cosmological source evolution, source spectra and composition at injection from the partial recovery of the degraded information carried by the ultra high energy cosmic rays can be gained.

In this presentation the activities for acoustic sensor development and calibration in the Aachen Acoustic Laboratory (AAL) and at EPFL, Lausanne, are discussed.

The AAL is a facility for acoustic sensor R&D and calibration in water and ice, as well as a systematic study of the thermo-acoustic effect. It consists of a 3m^3 cylindrical tank inside a cooling container which can achieve temperatures down to -25℃. The tank has a freeze control unit which can produce a large volume of bubble-free clear ice. Inside the tank, 18 piezo-based sender/sensor-pairs are mounted on an aluminum frame on three levels embedded in the ice volume and serve as reference. Thermo acoustic signals are induced by short pulses from a Nd:YAG laser mounted on top of the container.

The AAL sensors are calibrated absolutely by means of the reciprocity method and can be used for calibration of other acoustic devices as well as detailed systematic studies of the thermo-acoustic effect. First calibrations of AAL and SPATS sensors are presented.

Multi-channel digital sensors developed at EPFL reach a self noise level of about 3 mPa and pointing capabilites of a few degrees. The steel housing and digital communication over large distance make them suitable for deep deployment. The technology, the sensitivity and the pointing performances of these sensors will be reported and future consequent opportunities discussed.

Auteurs principaux: PAUL, Larissa (RWTH Aachen); RIBORDY, Mathieu (EPFL Lausanne); MEURES, Thomas (RWTH Aachen)

Orateurs: PAUL, Larissa (RWTH Aachen); RIBORDY, Mathieu (EPFL Lausanne); MEURES, Thomas (RWTH Aachen)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **15** Type: **oral presentation**

Probing cosmic rays in AGN and Clusters of Galaxies using radio observations

mardi 29 juin 2010 18:40 (20 minutes)

We are looking for radio relics' andhalos' in an X-ray selected sample of clusters of galaxies. Most galaxy clusters have cool cores with AGN (Active Galactic Nuclei) at their centre. These AGN contain particle bubbles that show non-thermal radio emission. The presence of radio relics και halos' observed at the periphery of the cluster radio structure could be explained if the bubbles can restrict cosmic rays efficiently.
Using radio (total intensity and polarization) data of AGN and X-ray observations of clusters of galaxies the intracluster magnetic fields and electron densities can be estimated and acceleration mechanisms of cosmic particles can be revealed.
The current article presents the progress of our work and future plans. We use radio and X-ray data of two powerful radio galaxies, hosts in galaxy clusters within dense environments. We study the role that intracluster magnetic fields, as well as jets and halos/relics play in the formation and acceleration of cosmic rays.
We also search for the relation between the extended regions of radio emission (known asrelics' and 'halos') and the cosmic rays, using our high quality radio data.

Auteur principal: Dr GIZANI, Nectaria (Hellenic Open University, School of Science and Technology)

Orateur: Dr GIZANI, Nectaria (Hellenic Open University, School of Science and Technology)

Classification de Session: From radioastronomy to high energy particles

ID de Contribution: **16** Type: **oral presentation**

Radar for Detection of Ultra-High-Energy Neutrinos Reacting in a Rock Salt Dome

vendredi 2 juillet 2010 11:00 (20 minutes)

We measured radio wave reflection from rock salt irradiated by a 2MeV-electron beam in a wave guide filled with rock salt. We found that the reflected power of the radio wave was proportional to square of the electron-beam current with constant electron energy of 2MeV, simultaneously temperature of the rock salt was measured to be proportional to the electron beam current. It is explained that the reflected power is proportional to square of refractive index of heated part of the rock salt (see Fresnel equations) and the refractive index of the rock salt lineally increases with the temperature (see James C. Owens, Phys. Rev. 118(1969)1228).

Summary

We found radio wave reflection from rock salt irradiated by an electron beam. The effect would be applicable to detect ultra-high-energy neutrinos in a huge rock salt dome. By a radar with peak power of 1GW at 10MHz, we could detect them with the rage of 0.5km to 3km for 10^17eV to 10^19eV GZK neutrinos, respectively, taking into account the attenuation length of the radio wave. We expect to measure around 10 GZK neutrinos/year by the radar system which has a several surface antennas emitting radio wave downward and receiving upward, respectively. They are placed on a floor of an excavated space of a rock salt dome.

Auteur principal: Dr CHIBA, Masami (Tokyo Metropolitan University)

Co-auteurs: Dr YABUKI, Fumiaki (Tokyo Metropolitan University); M. AKIYAMA, Hidetoshi (Seikei University); Mlle KATAOKA, Hiromi (Seikei University); Prof. FUJII, Masatoshi (Shimane University); Prof. UTSUMI, Michiaki (Tokai University); Prof. YASUDA, Osamu (Tokyo Metropolitan University); Prof. KON, Tadashi (Seikei University); M. KAMIJO, Toshio (Tokyo Metropolitan University); Prof. CHIKASHIGE, Yuichi (Seikei University); M. SHIMIZ, Yutaka (Seikei University)

Orateur: Dr CHIBA, Masami (Tokyo Metropolitan University)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **17** Type: **oral presentation**

The KASCADE-Grande Experiment

jeudi 1 juillet 2010 15:10 (30 minutes)

KASCADE-Grande is a multi-detector experiment at KIT (Karlsruhe Institute of Technology), in Germany for measuring extensive air showers in the primary energy range of 100 TeV to 1 EeV. This presentation attempts to provide a synopsis of the current results of the experiment. In particular, the all-particle energy spectrum will be discussed. In addition, investigations on the elemental composition of the cosmic particles as well as tests of hadronic interaction models
underlying the analyses will be presented. As KASCADE-Grande serves also as host of the LOPES radio detection experiment where both experiments
measure the same showers, special emphasis will be given in comparing the characteristics and feasibility of both techniques in estimating the main parameters of high-energy primary cosmic rays: energy, composition, and arrival direction.

Auteur principal: Dr HAUNGS, Andreas (KIT)

Co-auteur: KASCADE-GRANDE COLLABORATION, .. (KIT)

Orateur: Dr HAUNGS, Andreas (KIT)

Classification de Session: ”Up to the knee” cosmic rays

ID de Contribution: **18** Type: **oral presentation**

A broad-band radio attenuation model for Antarctica

mercredi 30 juin 2010 15:30 (20 minutes)

We have developed an electromagnetic attenuation model for Antarctic ice in the frequency band 1MHz - 5GHz, appropriate for experiments such as ANITA or ARA which propose to detect high energy cosmic particles via radio emission induced in the continental ice. The model incorporates a frequency model of ice conductivity dependent on local temperature and ionic impurity concentrations. Temperature profiles are taken from the current time slice of a 4D dynamical calculation by Fastook. Impurities are based on measurements by the ITASE group at 414 sites around the continent. Surface and bedrock contours are taken from the BEDMAP collaboration. A low attenuation region near 90 degree longitude and -84 degree latitude seems well suited to location of a large radio array.

Auteur principal: M. JAVAID, Amir (University of Delaware)

Co-auteurs: COLLABORATION, ANITA (ANITA collaboration); Prof. SECKEL, David (University of Delaware); Prof. CLEM, John (University of Delaware)

Orateur: Prof. SECKEL, David (University of Delaware)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **19** Type: **Non spécifié**

Get to know HELYCON –The alternative cosmic ray telescope

mardi 29 juin 2010 14:00 (20 minutes)

The HEllenic LYceum Cosmic Observatories Network is a collaboration between Greek and Universities and the Cypriot open University as well as national Research Centres and Educators of the western greek prefecture.
HELYCON is an original telescope-array, which detects extensive Air Showers of very energetic cosmic rays coming from galactic and extragalactic sources. It is used not only for scientific purposes, but also for educational ones allowing students, teachers and pupils to participate to the experiment.
It consists of scintillation counters and radio antennas. The antennas are going to be used to detect radio signals coming from the cosmic rays detected by the counters. Each station consists of 3 detectors and one antenna. Such stations are distributed over greater Patra, Thessaloniki, the Chios and Cyprus Islands.
HELYCON is also used for the calibration of KM3NeT, the future Mediterranean neutrino telescope. We report on the design, construction and performance of this prototype detector array.

Auteur principal: Dr GIZANI, Nectaria (Hellenic Open University, School of Science and Technology)

Co-auteurs: Dr LEISOS, A (HOU); Dr TSIRIGOTIS, A. (HOU); Dr CHRISTOPOULOU, E (Univ. of Patras); M. BOURLIS, G (HOU); Prof. TZAMARIAS, S. (HOU)

Orateur: Dr GIZANI, Nectaria (Hellenic Open University, School of Science and Technology)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **20** Type: **oral presentation**

IceCube's Radio Extension: Status and Results

mercredi 30 juin 2010 12:00 (20 minutes)

In 2006-2010, several Radio Frequency (RF) detectors and calibration equipment were deployed as part of the IceCube array at depths between 5 to 1400 meters in preparation for a future large scale GZK detector. IceCube's deep holes and well-established data handling system provide a unique opportunity for deep-ice RF detection studies at the South-Pole.

I will present verification and calibration results as well as status-review of ongoing analyses such as ice-properties, RF noise, reconstruction algorithms and GZK limits.

Auteur principal: Dr LANDSMAN, Hagar (University of Wisconsin, Madison)

Orateur: Dr LANDSMAN, Hagar (University of Wisconsin, Madison)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **21** Type: **oral presentation**

Recent results from the RICE experiment at the South Pole

mercredi 30 juin 2010 10:10 (30 minutes)

The RICE experiment on detection of UHE neutrinos has been running over a decade. The experiment comprises an array of radio antennas buried in ice to the deptn of up to 300 meters near the geographic South Pole, and is designed to observe neutrino interactions in ice employing the radio Cherenkov technique. We discuss new limits on the diffuse UHE neutrino flux that now include the full dataset accumulated over 10 years and benefit from new analysis techniques. We also present our recent measurements of birefringent properties of ice at the experiment location.

Auteur principal: KRAVCHENKO, Ilya (University of Nebraska-Lincoln)

Orateur: KRAVCHENKO, Ilya (University of Nebraska-Lincoln)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **22** Type: **oral presentation**

The UK ACoRNE Group Present Projects and Future Plans

vendredi 2 juillet 2010 09:30 (30 minutes)

This will present an overview of the current state of the ACoRNE collabaration, including upper limits on neutrino fluxes and recent work on primordial black hole detection.

Auteur principal: Prof. DANAHER, Sean (Northumbria University)

Co-auteur: M. OOPPAKAEW, Wichian (Northumbria University)

Orateur: Prof. DANAHER, Sean (Northumbria University)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **23** Type: **oral presentation**

Development of combined sensors for UHE neutrino detection

vendredi 2 juillet 2010 11:40 (20 minutes)

For future deep-sea neutrino telescopes, the use of acoustic sensors in combination with optical sensors in one detection module could provide unique properties, e.g. complementary neutrino detection methods, inherent position and orientation calibration ability and an enhanced possibility to study the deep-sea environment. A technical advantage of such combined opto-acoustical modules would be the reduction of DAQ hardware and thus costs as well as reducing potentially problematic mechanic parts at the sensor module level. The main challenge for the feasibility is related to the possible interference between optical part and acoustic part.

The presentation describes first steps towards the realisation of a combined opto-acoustical module.

Auteur principal: M. ENZENHÖFER, Alexander (ECAP)

Orateur: M. ENZENHÖFER, Alexander (ECAP)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **24** Type: **Non spécifié**

An Acoustic Hydrophone linear array callibrator for UHE Neutrinos

mardi 29 juin 2010 14:00 (20 minutes)

The development of a new microcontroller eight channel hydrophone array driver will be presented and results shown for single channel tests, which show excellent agreement with the earlier LabView/PC based system.
Results of the deployment of the single channel system at the Rona test will be presented and predictions for the pulses generated by the linear array, particularly regarding the pancake shape will be made.

Auteurs principaux: Prof. DANAHER, Sean (Northumbria University); M. OOPPAKAEW, Wichian (Northumbria University)

Orateurs: Prof. DANAHER, Sean (Northumbria University); M. OOPPAKAEW, Wichian (Northumbria University)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **25** Type: **oral presentation**

Time-domain Cherenkov radio pulses from showers in dense media

mercredi 30 juin 2010 12:40 (20 minutes)

We have developed an algorithm to obtain the electric field of the Cherenkov radio pulse in the time domain as produced by a single charged particle track in a dielectric medium. The algorithm is implemented in a Monte Carlo simulation of electromagnetic showers in dense media, and the coherent Cherenkov radio emission can be obtained simultaneously in the time and frequency domains allowing a direct comparison of the two approaches. The shape of the bipolar pulse in the time domain is shown to be directly related to the depth development of the excess charge in the shower, and its spread in time to the observation angle with respect to the Cherenkov direction. This information can be of great importance for interpreting actual data.

Auteur principal: Dr ALVAREZ-MUNIZ, Jaime (Dept. Particle Physics, Univ. Santiago de Compostela, Spain)

Co-auteurs: Dr ROMERO-WOLF, Andres (Dept. Physics, Univ. of Hawaii, USA); Prof. ZAS, Enrique (Dept. Particle Physics, Univ. Santiago de Compostela, Spain)

Orateur: Dr ROMERO-WOLF, Andres (Dept. Physics, Univ. of Hawaii, USA)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **26** Type: **oral presentation**

Autonomous radio-detection of EAS with the TIANSHAN Radio Experiment for Neutrino Detection

mardi 29 juin 2010 17:50 (30 minutes)

The TIANSHAN Radio Experiment for Neutrino Detection (TREND) is a collaboration initiated in 2008 between the Chinese Academy of Science and the French IN2P3. This stand-alone antenna array aims at performing the radio-detection of extensive air shower (EAS) created by high energy neutrinos (>10^16.5 eV).
The TREND experiment is deployed on the site of 21CMA, a giant radio-telescope built in the TianShan mountains (China) for the study of the Epoch of Reionization. TREND is using a large part of the 21CMA equipment and facilities.
In 2009, a prototype of 6 antennas was set-up in order to test self-triggering radio-detection and rejection of background events induced by local radio sources. Data were successfully acquired for several weeks. In January 2010, the TREND array was extended to 15 antennas and is presently in continuous data acquisition. A reduced particle detector array (3 scintillators) was also deployed in order to perform an off-line validation of the EAS candidates selection.
Results obtained with the 2009 prototype array, as well as preliminary analysis from the present configuration (including the first coincidences observed between the ground and radio array) will be presented.
Prospects for neutrino detection with the TREND experiment will also be discussed.

Auteur principal: MARTINEAU-HUYNH, Olivier (IN2P3-CAS)

Orateur: MARTINEAU-HUYNH, Olivier (IN2P3-CAS)

Classification de Session: From radioastronomy to high energy particles

ID de Contribution: **27** Type: **oral presentation**

Status of air shower simulations

jeudi 1 juillet 2010 15:40 (30 minutes)

Present status of extensive air shower (EAS) simulation procedures is reviewed. The advantages of combining numerical and Monte Carlo (MC) methods for the description of air shower development are demonstrated. The relation to experimental techniques for the studies of high energy cosmic rays is also addressed. The uncertainties in the predicted EAS characteristics are analysed and potential improvements in the accuracy of the predictions are discussed.

Auteur principal: Dr OSTAPCHENKO, Sergey (Norwegian University for Science and Technology (NTNU))

Orateur: Dr OSTAPCHENKO, Sergey (Norwegian University for Science and Technology (NTNU))

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **28** Type: **oral presentation**

Modeling radio signals from Extensive Air Showers

jeudi 1 juillet 2010 17:50 (20 minutes)

The time variation of a net macroscopic current in the thin shower front of an Extensive Air Shower gives rise to an electromagnetic pulse. This pulse will be emitted within the radio frequency range. A macroscopic model has been developed to simulate this radio pulse. Recent developments of this model will be discussed. Furthermore with the use of Monte-Carlo simulations we have investigated the influence of the primary composition of the cosmic ray on different shower parameters, and as a direct consequence the radio pulse emitted by proton or iron induced air showers. A different study has been done looking into polarization effects for the different emission mechanisms due to different sources of charge separation.

Auteur principal: DE VRIES, Krijn (KVI/University of Groningen)

Co-auteurs: WERNER, Klaus (SUBATECH University of Nantes –IN2P3/CNRS–EMN, Nantes, France); SCHOLTEN, Olaf (KVI/University of Groningen)

Orateur: DE VRIES, Krijn (KVI/University of Groningen)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **29** Type: **oral presentation**

The Askaryan Radio Array

mercredi 30 juin 2010 14:20 (30 minutes)

Building on the expertise gained by RICE, ANITA and IceCube's radio extension in the use of the Askaryan effect in cold Antarctic ice, we are currently developing an antenna array known as ARA (The Askaryan Radio Array) to be installed in boreholes extending 200 m below the surface of the ice near the geographic South Pole. The unprecedented scale of ARA, which will cover a fiducial area of 80 square kilometers, was chosen to ensure the detection of the flux of neutrinos "guaranteed" by the observation of the GZK cutoff by HiRes and the Pierre Auger Observatory. Funding to develop the instrumentation and install the first prototypes has been granted, and the first components of ARA are planned for installation during the austral summer of 2010-2011. Within 3 years of commencing operation, the full ARA will exceed the sensitivity of any other instrument in the 0.1-10 EeV energy range by an order of magnitude. The primary goal of the ARA array is to establish the absolute cosmogenic neutrino flux through a modest number of events.

Auteur principal: Prof. HOFFMAN, Kara (University of Maryland)

Orateur: Prof. HOFFMAN, Kara (University of Maryland)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **30** Type: **Non spécifié**

Microwave detection of air showers with MIDAS

jeudi 1 juillet 2010 10:00 (30 minutes)

Microwave emission due to molecular bremsstrahlung in the free electron collisions with the neutral molecules in the atmosphere (within the plasma produced by the cascade ionization) could be used to detect extensive air showers. Measurements show that molecular bremsstrahlung scales quadratically with the primary energy and is isotropic and unpolarized, and thus it could be used to obtain near calorimetric measurement of the cosmic ray energy and good sensitivity to the mass of the primary in an air shower detector. MIDAS (MIcrowave Detector of Air Showers) is a prototype of a microwave telescope to detect extensive air showers: it images a 20x10 degrees field of view with a 4.5 meters parabolic reflector and 53 4GHz feeds in the focal plane. It has been commissioned in March 2010 and is currently taking data. We will present the design, performance and first results of Midas.

Auteur principal: FACAL SAN LUIS, Pedro (University of Chicago, KICP)

Orateur: FACAL SAN LUIS, Pedro (University of Chicago, KICP)

Classification de Session: Auger and the radio projects, reviews and results

ID de Contribution: **31** Type: **oral presentation**

REAS3: A revised implementation of the geosynchrotron model for radio emission from air showers

jeudi 1 juillet 2010 17:10 (20 minutes)

The Monte Carlo-code REAS simulates radio emission from cosmic ray air showers based on the geosynchrotron model. In this talk, we present a revised version of the geosynchrotron model as implemented in REAS3. In the previous version of the code, emission due to the variation of the number of charged particles within an air shower was not taken into account. These emission contributions were implemented in the model by the inclusion of "end-point contributions". With this revision, the structure of the simulated radio pulses changes from unipolar to bipolar, and the azimuthal emission pattern becomes nearly symmetric. Remaining asymmetries can be explained by radio emission due to the variation of the net charge excess in air showers, which is automatically taken into account in the new implementation. REAS3 constitutes the first self-consistent time-domain implementation of a radio emission model taking the full complexity of air shower physics into account. The predictions of REAS3 on radio emission and the possibilities for application of REAS3 will be presented as well.

Auteur principal: Mlle LUDWIG, Marianne (Karlsruhe Institute of Technology)

Co-auteur: Dr HUEGE, Tim (Karlsruhe Institute of Technology)

Orateur: Mlle LUDWIG, Marianne (Karlsruhe Institute of Technology)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **32** Type: **oral presentation**

SalSA

vendredi 2 juillet 2010 12:00 (20 minutes)

I will give a status report on the SalSA project. SalSA is a proposed experiment aiming to measure ultra-high energy neutrinos which would consist of an array of antennas embedded in one of the many several km^3 salt formations that exist in many places around the world. So far the focus of the SalSA effort has been to establish its feasibility through in situ measurements of radio attenuation in salt. I will review these measurements, including a recent return visit to the Hockley Salt Mine in Texas, and discuss future plans for SalSA.

Auteur principal: Dr CONNOLLY, Amy (University College London)

Orateur: Dr CONNOLLY, Amy (University College London)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **33** Type: **oral presentation**

The LOPES experiment –recent results, status and perspectives

mercredi 30 juin 2010 16:20 (30 minutes)

The LOPES experiment at the Karlsruhe Institute of Technology has been taking radio data in the frequency range from 40 to 80 MHz in coincidence with the KASCADE-Grande air shower detector since 2004. Various experimental configurations have been employed to study aspects such as the energy scaling, geomagnetic dependence, lateral distribution, and polarization of the radio emission from cosmic rays. The high quality per-event air shower information provided by KASCADE-Grande has been the key to many of these studies and has even allowed us to perform detailed per-event comparisons with simulations of the radio emission. In this presentation, we will give an overview of recent results obtained by LOPES, and present the status and perspectives of the ever-evolving experiment.

Auteur principal: Dr HUEGE, Tim (Karlsruhe Institute of Technology)

Co-auteur: FOR THE LOPES COLLABORATION, - (-)

Orateur: Dr HUEGE, Tim (Karlsruhe Institute of Technology)

Classification de Session: Cosmic ray radio decametric detection, signal nature and current experiments

ID de Contribution: **34** Type: **oral presentation**

A detailed comparison of REAS3 and MGRM radio emission simulations

jeudi 1 juillet 2010 16:10 (30 minutes)

Two very different approaches have been developed for the modelling of radio emission from cosmic ray air showers: the geosynchrotron model, implemented with Monte Carlo techniques in REAS3, and the MGMR model, based on a macroscopic description of transverse currents. Comparing the predictions of these very different models is a powerful way to gauge our understanding of radio emission theory. In this presentation, we show a direct comparison of radio emission simulations with both REAS3 and MGRM. We demonstrate that, for the first time, two completely different models produce similar results, except for regions of parameter space where the differences in the underlying air shower model become important.

Auteur principal: Dr HUEGE, Tim (Karlsruhe Institute of Technology)

Co-auteurs: M. DE VRIES, Krijn (Kernfysisch Versneller Instituut); Mlle LUDWIG, Marianne (Karlsruhe Institute of Technology); Dr SCHOLTEN, Olaf (Kernfysisch Versneller Instituut)

Orateur: Dr HUEGE, Tim (Karlsruhe Institute of Technology)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **35** Type: **Non spécifié**

Radio pulses from electromagnetic, hadronic and neutrino-induced showers up to EeV energies

mardi 29 juin 2010 14:00 (20 minutes)

We present ZHAireS a Monte Carlo code that allows the calculation of the Cherenkov radio pulse emitted by electromagnetic, hadronic and neutrino-induced showers in ice up to the EeV energies. ZHAIRES combines the high energy hadronic interaction capabilities of AIRES, and the dense media propagation capabilities of TIERRAS, with the precise low energy tracking and specific algorithms developed to calculate the radio emission in ZHS. The characteristics of hadronic showers and the corresponding Cherenkov radio pulses are compared with those from purely electromagnetic showers in both the time and frequency domains.
The code and algorithms developed also serve to predict radio emission in extensive air showers, automatically accounting for both the synchrotron and Cherenkov radiation mechanisms.

Auteur principal: Dr JAIME, Alvarez-Muniz (Dept. Particle Physics, Univ. Santiago de Compostela)

Co-auteurs: Prof. ZAS, Enrique (Dept. Particle Physics, Univ. Santiago de Compostela); Dr TUEROS, Matias (Dept. of Physics, Univ. of La Plata, Argentina); Dr CARVALHO JR., Washington R. (Dept. Particle Physics, Univ. Santiago de Compostela)

Orateur: Dr CARVALHO JR., Washington R. (Dept. Particle Physics, Univ. Santiago de Compostela)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **36** Type: **oral presentation**

Observation of UHE Cosmic Rays from a Balloon-borne Radio Interferometer

mercredi 30 juin 2010 09:30 (20 minutes)

The ANtarctic Impulsive Transient Antenna (ANITA) is a balloon-borne antenna array designed to detect coherent radio Cherenkov radiation from ultra-high energy (UHE) neutrino-induced particle showers in the Antarctic ice sheet. The data of the first flight (2006-2007) have been re-analyzed using more sensitive radio-interferometric mapping technique. This approach has produced a statistically significant set of 16 cosmic ray events. I will present an overview of the analysis techniques along with the first ultra-wideband, far-field measurements of the radio spectral density of geosynchrotron emission in the range from 300-1000 MHz.

Auteur principal: M. ROMERO-WOLF, Andres (University of Hawaii)

Orateur: M. ROMERO-WOLF, Andres (University of Hawaii)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **37** Type: **oral presentation**

Analysis of the radio detection of inclined showers with LOPES

mercredi 30 juin 2010 17:20 (20 minutes)

We report here on analysis of 20 months of data taken with the LOPES radio antenna array set up in coincidence with the Grande array, both located at the Karlsruhe Institute of Technology, Germany. The radio antenna system is composed of 30 inverse-V-shape dipole antennas, 15 oriented in East-West and 15 oriented in the North-South direction.

We have restricted the analysis to a special selection of inclined showers (zenith angle > 40^0). These inclined showers are of a particular interest because they are the events with the largest geomagnetic angles and are
therefore suitable to test the model of the geosynchrotron based emission in EAS.

Effects of the applied antenna model in the calibration procedure on the reconstructed observables were studied. In particular, we have focused on one component of the antenna, a metal pedestal, which generates a resonance effect, a peak in the amplification pattern where it's most effecting zenith angles in the range of inclined showers.

In addition, polarization characteristics of inclined showers were studied in detail and compared with the features of more vertical showers for the two cases of antenna models, with and without the pedestal.

Auteur principal: Mlle SAFTOIU, Alexandra (National Institute for Physics and Nuclear Engineering Horia Hulubei)

Orateur: Mlle SAFTOIU, Alexandra (National Institute for Physics and Nuclear Engineering Horia Hulubei)

Classification de Session: Cosmic ray radio decametric detection, signal nature and current experiments

ID de Contribution: **38** Type: **oral presentation**

Neutrino-Nucleon Cross Sections at High Energies

jeudi 1 juillet 2010 18:50 (20 minutes)

Ultra-high energy neutrino experiments can probe neutrino-nucleon cross sections at center-of-mass energies higher than those of typical interactions at the LHC, where deviations from the standard model expectation can signal new physics. We will present new calculations of the neutrino-nucleon charged and neutral current cross sections and their theoretical uncertainties in the range 10^10-10^21 eV using the latest parton distribution functions (PDF's) by Martin, Stirling, Thorne and Watt (MSTW 2008). The MSTW PDF's are based on global fits to recent hard scattering data on as wide a range of processes as possible. The PDF uncertainty is more conservative at small x (high energy) than many other PDF's due to a more flexible parameterisation in this region. We will also present a parameterization of the cross sections for ease of use in modeling. Finally, we will discuss the implications for future neutrino experiments.

Auteur principal: Dr CONNOLLY, Amy (University College London)

Co-auteurs: Dr WATERS, David (University College London); Dr THORNE, Robert (University College London)

Orateur: Dr CONNOLLY, Amy (University College London)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **39** Type: **oral presentation**

R&D studies for the development of a compact transmitter able to mimic the acoustic signature of a UHE neutrino interaction

vendredi 2 juillet 2010 11:20 (20 minutes)

Calibration of acoustic neutrino telescopes with neutrino-like signals is an essential aspect to evaluate the feasibility of the technique and to know the efficiency of the detectors. However, it is not straightforward to have acoustic transmitters that, on one hand, are able to mimic the signature of a UHE neutrino interaction, that is, a bipolar acoustic pulse with the 'pancake'directivity, and, on the other hand, fulfill practical issues such as ease of deployment and operation. This is a non-trivial problem since it requires directive transducer with cylindrical symmetry for a broadband frequency range. Classical solutions using linear arrays of acoustic transducers result in long arrays with many elements, which increase the cost and the complexity for deployment and operation. In this paper we present the extension of our previous R&D studies using the parametric acoustic source technique by dealing with the cylindrical symmetry, and demonstrating that it is possible to use this technique for having a compact solution that could be much more easily included in neutrino telescope infrastructures or used in specific sea campaigns for calibration.

Auteur principal: Dr ARDID, Miguel (IGIC- Universitat Politècnica de València)

Co-auteurs: CAMARENA, Francisco (IGIC- Universitat Politècnica de València); LAROSA, Giuseppina (IGIC- Universitat Politècnica de València); MARTÍNEZ-MORA, Juan A. (IGIC- Universitat Politècnica de València); BOU-CABO, Manuel (IGIC- Universitat Politècnica de València); ADRIÁN, Silvia (IGIC- Universitat Politècnica de València); ESPINOSA, Víctor (IGIC- Universitat Politècnica de València)

Orateur: BOU-CABO, Manuel (IGIC- Universitat Politècnica de València)

Classification de Session: Neutrino detection in water and salt (acoustic and radio)

ID de Contribution: **40** Type: **oral presentation**

An Observational Limit on the Ultra-High-Energy Cosmic Neutrino Flux from the Second Flight of the ANITA Experiment

mercredi 30 juin 2010 09:00 (30 minutes)

The ANtarctic Impulsive Transient Antenna (ANITA) is a balloon borne antenna array designed to detect coherent radio Cherenkov radiation produced by ultra-high-energy neutrinos (UHE, $E > 10^{18}eV$) interacting in the Antarctic ice sheet. ANITA completed its second science flight in the Austral Summer of 2008-09, launching on 21st December and recording over 20 million RF induced triggers during 30 days aloft. Improvements in sensitivity, along with increased time over deep ice, compared to the first flight of ANITA allow for the most sensitive investigation into the UHE neutrino flux to date. I will talk about the analysis of data taken during the 2nd flight, discuss analysis techniques used and present recent results.

Auteur principal: M. MOTTRAM, Matthew (UCL)

Co-auteur: THE ANITA COLLABORATION, N/A (N/A)

Orateur: M. MOTTRAM, Matthew (UCL)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **41** Type: **Non spécifié**

Signal classification for the acoustic neutrino detection test set-up AMADEUS

mardi 29 juin 2010 14:00 (20 minutes)

The AMADEUS system is designed to investigate the method of acoustic particle detection for neutrinos and the acoustic background in the deep sea. Located in the Mediterranean Sea, it consists of six clusters of six acoustic sensors each.
The background of transient acoustic signals in the deep sea is very diverse stemming from anthropogenic and biological sources as well as weather correlated sources on the sea surface like breaking waves. This situation makes a powerful classification scheme very important.
As a first step, the incoming continuous data stream is subjected to an on-line filter in order to reduce the amount of data stored for off-line classification and reconstruction. This is performed by a filter set-up consisting of a self adjusting amplitude threshold for transient signals and a matched filter for bipolar-like signals. From the on-line filtered data the features of the waveform in the time and frequency domain are extracted as well as from the results of matched filters with different reference signals. The resulting feature vector is used for the classification, which consists of a chain of machine learning algorithms trained and tested with simulation data.

Within the presentation the simulation chain and the key features of the classification will be described.

Auteur principal: NEFF, Max (Erlangen Centre for Astroparticle Physics (ECAP))

Orateur: NEFF, Max (Erlangen Centre for Astroparticle Physics (ECAP))

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **42** Type: **oral presentation**

Radio Detection of Cosmic-Ray-Induced Air Showers at the Pierre Auger Observatory

jeudi 1 juillet 2010 11:00 (30 minutes)

AERA — the Auger Engineering Radio Array — is currently being set up at the southern site of the Pierre Auger Observatory. AERA will explore the potential of the radio detection technique to cosmic ray induced air showers with respect to the next generation of large-scale surface detectors. As AERA is co-located with the low energy enhancements of the Pierre Auger Observatory, the observation of air showers in coincidence with the Auger surface and fluoresence detectors will allow us to study the radio emission processes in detail and to calibrate the radio signal. Finally, the combined reconstruction of shower parameters with three independent detectors promises new insights into the nature of cosmic rays in the transition region from 10^{17} to 10^{19} eV.
Besides the detection of coherent radiation in the MHz frequency range, the setups AMBER [1] and MIDAS [2] prepare to check the possibility to detect air showers due the emission of molecular bremsstrahlung in the GHz range at the Auger site. We present the status of the radio detection setups and discuss their physics potential as well as experimental challenges. We will focus on the first installatuion phase of AERA which is the startup to the construction of a 20 km^2 radio array.

\noindent [1] Air-shower Mircrowave Bremsstrahlung Experimental Radiometer\\
\noindent [2] MIcrowave Detection of Air Showers

Auteur principal: FLIESCHER, Stefan (RWTH Aachen University)

Orateur: FLIESCHER, Stefan (RWTH Aachen University)

Classification de Session: Auger and the radio projects, reviews and results

ID de Contribution: **43** Type: **oral presentation**

A parametric model for radio emission from air showers.

jeudi 1 juillet 2010 17:30 (20 minutes)

A parametric model for the "geo-synchrotron" radio emission from cosmic ray air showers is presented. The shower is treated as a smooth macroscopic current source, separable in cartesian "shower"-coordinates, which facilitates calculation of phase coherence at a remote detector. Time delays are kept to second order in shower size/distance (d/R), and account for varying index of refraction along the shower profile. Local current distributions within the shower attempt to account for particle generation, energy losses, multiple soft coulomb scattering, and magnetic deflections in the altitude dependent radiation length upstream of the emission point. For highly inclined showers at high frequencies (f>200 MHz), the model predicts a quasi geo-synchrotron polarization pattern, within a sharp Cerenkov-like phase coherent ring of less than 1 deg radius. For lower frequencies and more vertical showers, the phase coherent region widens and partially fills in to form a disk like beam.

Auteur principal: SECKEL, David (University of Delaware)

Orateur: SECKEL, David (University of Delaware)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **44** Type: **oral presentation**

Direct cosmic-ray detection

jeudi 1 juillet 2010 14:40 (30 minutes)

One century after the discovery of cosmic rays, many questions remain open on its origin, nature, and transport. Experiments to detect them directly have constantly improved and are today highly diversified to address different cosmic-ray processes over a wide energy range. Indeed, precise measurements of cosmic rays in an energy range from ~10^4 eV to ~10^15 eV allow one to study the mechanism of acceleration of primary cosmic rays up to very high energy, to characterise their possible sources, and to clarify their interactions with the interstellar medium. Such measurements of elemental cosmic-ray spectra require complementary and redundant charge and energy identification detectors, such as the balloon-borne Cosmic Ray Energetics And Mass (CREAM) experiment, which measures cosmic rays from 10^12 eV to 10^15 eV over the elements ranging from protons to iron. I will present the current status of direct cosmic-ray measurements with the focus on the latest CREAM results. Finally, the cosmic-ray identification above the knee is shortly discussed.

Auteur principal: Dr PUTZE, Antje (Oskar Klein Center / Stockholm University / KTH)

Orateur: Dr PUTZE, Antje (Oskar Klein Center / Stockholm University / KTH)

Classification de Session: ”Up to the knee” cosmic rays

ID de Contribution: **45** Type: **oral presentation**

Study Cherenkov Radiation Induced by high energy particle showers in dielectric medium

mercredi 30 juin 2010 15:10 (20 minutes)

Askaryan proposed to detect Cherenkov signals by radio wave from the negative charge excess of particle showers 50 years ago. The theory of Cherenkov pulses with Fraunhofer approximation was widely studied in last two decades. However, at high energies or for high density materials, interacting processes are suppressed by a mechanism formulated by Landau, Pomeranchuck and Migdal. The LPM effect in electromagnetic showers, For example, a 100 EeV cascade can be 100 m long has studied in few Monte Carlo simulations. The ground base radio detector experiments (e.g. RICE, AURA, and ARA) has deployed or proposed. The far field approximation was fail when the sizes of the particle showers (D) and the detection distances(L) is L<D^2/λ.
We present two ab initio methods of Cherenkov pulses based on the finite-difference time-domain (FDTD) method, and modified time domain integration method of the radio signal which original proposed by arxiv:1002.3873 for far-field study. Our method provides a straightforward way of the near field calculation, which would be important for ultra high energy particle showers, especially the electromagnetic showers induced by the high energy leptons produced in the neutrino charge current interactions.

Auteur principal: M. CHEN, Chih-Ching (National Taiwan University)

Orateur: M. CHEN, Chih-Ching (National Taiwan University)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **47** Type: **oral presentation**

Radio Transient Detection and a Future Radio GZK Array

mercredi 30 juin 2010 14:50 (20 minutes)

The Askar'yan Radio Array of antennas (ARA) is currently being planned for construction and deployment in Antarctica in the coming years. It will cover an area of order 80 square kilometers which will almost certainly be sufficient to prove the Askar'yan technique and establish existence of the GZK neutrino flux. ARA will utilize waveform capture of transient impulses in order to reduce anthropogenic backgrounds and provide additional information for event reconstruction. However, it is possible to reconstruct events entirely from information available at trigger level. This technique may prove viable for future large-scale arrays which must be constructed to study the physics of UHE sources and to use the GZK neutrino flux as a probe for physics beyond the Standard Model.

Auteur principal: Prof. HANSON, Kael Hanson (Université)

Orateur: Prof. HANSON, Kael Hanson (Université)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **48** Type: **Non spécifié**

Results from polarization studies of radio signals induced by cosmic rays at the Pierre Auger Observatory

jeudi 1 juillet 2010 11:30 (20 minutes)

At the Pierre Auger Observatory, the radio emission from cosmic-ray-induced air showers is measured. I will discuss the physics results from a setup consisting of three antennas triggered by an auxiliary particle detector. With this setup, a total 494 events were registered in coincidence with the surface detector of the Pierre Auger Observatory. This data allows us to study the dependence of the radio signal on air shower parameters. From an analysis of the measured polarization of the radio signals, we conclude that the emission is dominated by the geomagnetic mechanism.
However, the polarization study indicates that the pure geomagnetic description by itself is not sufficient to describe all features of the data set.

Auteur principal: SCHOORLEMMER, Harm (Radboud university nijmegen)

Orateur: SCHOORLEMMER, Harm (Radboud university nijmegen)

Classification de Session: Auger and the radio projects, reviews and results

ID de Contribution: **49** Type: **Non spécifié**

Design and first tests of an acoustic positioning and detection system for KM3NeT

mardi 29 juin 2010 14:00 (20 minutes)

In a deep-sea neutrino telescope it is mandatory to locate the position of the optical sensors with a precision of about 10 cm. To achieve that requirement, an innovative Acoustic Positioning System (APS) has been designed in the frame work of the KM3NeT neutrino telescope. The system will also be able to provide an acoustic guide during the deployment of the telescope's components and seafloor infrastructures (junction boxes, cables,..). A prototype of the system, which based on the successful acoustic systems of ANTARES and NEMO its being realised. It will consist of an array of hydrophones and a network of acoustic transceivers forming the Long Baseline. All sensors are connected to the telescope data acquisition system and are in phase and synchronised with the telescope master clock. Data from the acoustic sensors, continuously sampled at 192 kHz, will be sent to shore where signal recognition and analysis will be carried out. The design and first tests of the system elements will be presented. This new APS is expected to have better precision compared to the systems used in ANTARES and NEMO, and can be also used as real-time monitor of acoustic sources and environmental noise in deep sea.

Auteur principal: SIMEONE, F. (Physics Department University "Sapienza" and INFN,Roma)

Co-auteurs: D'AMICO, A. (LNS-INFN); CALÌ, C. (LNS-INFN); LLORENS, C.D. (Institut de Gestiò Integrada de Zones Costaneres-UPV); AMELI, F. (Physics Department University "Sapienza" and INFN,Roma); SPEZIALE, F. (LNS-INFN); GIOVANETTI, G. (INGV); LAROSA, G. (Institut de Gestiò Integrada de Zones Costaneres-UPV); RICCOBENE, G. (LNS-INFN); ARDID, M. (Institut de Gestiò Integrada de Zones Costaneres-UPV); BONORI, M. (Physics Department University "Sapienza" and INFN,Roma); BOU-CABO, M. (Institut de Gestiò Integrada de Zones Costaneres-UPV); IMBESI, M. (LNS-INFN); RANDAZZO, N. (Università di Catania and INFN Catania); KELLER, P. (CPPM, CNRS/IN2P3 et Université de la Mediterranée); MASULLO, R. (Physics Department University "Sapienza" and INFN,Roma); VIOLA, S. (LNS-INFN); BERTIN, V. (CPPM, CNRS/IN2P3 et Université de la Mediterranée)

Orateur: SIMEONE, F. (Physics Department University "Sapienza" and INFN,Roma)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **50** Type: **Non spécifié**

A New Method to Calibrate Ionospheric Pulse Dispersion for UHE Cosmic Ray and Neutrino Detection using the Lunar Čerenkov Technique

mardi 29 juin 2010 14:00 (20 minutes)

UHE particle detection using the Lunar Čerenkov Technique aims to detect nanosecond pulses of Čerenkov emission which are produced during UHE cosmic ray and neutrino interactions in the Moon's regolith. These pulses will reach Earth-based telescopes dispersed, and therefore reduced in amplitude, due to their propagation through the Earth's ionosphere. To maximise the received signal to noise ratio and subsequent chances of pulse detection, ionospheric dispersion must therefore be corrected in real-time. This requires an accurate knowledge of the dispersion characteristic which is parameterised by the instantaneous Total Electron Content (TEC) of the ionosphere.

I will present a new method to calibrate the dispersive effect of the ionosphere on lunar Čerenkov pulses. This method exploits radial symmetries in the distribution of the Moon's polarised emission to make Faraday rotation measurements in the visibility domain of synthesis array data (i. e. instantaneously). Faraday rotation measurements are then combined with geomagnetic field models to estimate the ionospheric TEC. This method of ionospheric calibration is particularly attractive for the lunar Čerenkov technique as it may be used in real time to estimate the ionospheric TEC along a line-of-sight to the Moon.

Auteur principal: Dr MCFADDEN, Rebecca (ASTRON, the Netherlands Institute for Radio Astronomy)

Co-auteur: Prof. EKERS, Ron (Australia Telescope National Facilty)

Orateur: Dr MCFADDEN, Rebecca (ASTRON, the Netherlands Institute for Radio Astronomy)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **51** Type: **oral presentation**

Limits on the diffuse flux of ultra-high energy neutrinos using the Pierre Auger Observatory

jeudi 1 juillet 2010 09:30 (30 minutes)

The surface detector array of the Pierre Auger Observatory is sensitive to ultra-high energy neutrinos in the cosmic radiation, These particles can interact close to ground, both through charged and neutral currents in the atmosphere (down-going) and, for tau neutrinos, through the "Earth skimming"mechanism (up-going) where a tau lepton is produced in the Earth's curst that can emerge and decay in the atmosphere. Both types of neutrino induced events produce an inclined shower that can be identified by the presence of a broad time structure of signals in the water-Cherenkov detectors. Using data collected from the Pierre Auger Observatory, we present the corresponding limits on the diffuse ultra-high energy neutrino flux. Sources of possible backgrounds and systematic uncertainties are discussed. [Presented on behalf of the Pierre Auger Collaboration]

Auteur principal: Dr PASTOR, Sergio (IFIC Valencia)

Orateur: Dr PASTOR, Sergio (IFIC Valencia)

Classification de Session: Auger and the radio projects, reviews and results

ID de Contribution: **52** Type: **oral presentation**

Observables from the modelization of EASs radio emission

jeudi 1 juillet 2010 18:10 (20 minutes)

We present here results of two complementary approaches of the modelization of EAS radio emission: an analytical model using extremely simplified shower geometry and a full Monte Carlo simulation. Both are based on the general expression of an accelerated relativistic charge and assumes a refractive index fixed to unity. The main characteristics of the obtained electric field is discussed (among which its topology, its polarization and the importance of the arrival direction). A comparison between the results of these two approaches is presented, as well as a preliminary confrontation with other models and experimental measurements.

Auteur principal: RIVIERE, Colas (CPPM)

Orateur: RIVIERE, Colas (CPPM)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **53** Type: **oral presentation**

RASTA - a 'Radio Air-Shower Transients Array' for IceCube

mercredi 30 juin 2010 12:20 (20 minutes)

We explore the possibility to complement the cosmic ray physics program of the IceCube observatory with an extended surface array of radio antennas.

The combination of air-shower sampling on the surface and muon calorimetry underground offers significant scientific potential: the neutrino sensitivity above the horizon can be enhanced by vetoing air-showers on the ground, photon-induced air-showers can be identified by their small muon component and the coincident measurement of the particle density on the surface and the muon component gives useful information on the composition of the primary flux.

All of these analyses are pursued with the existing IceTop array. However, the IceTop footprint is small compared to the acceptance of the InIce sensor array, which severely limits the solid angle for coincident measurements, calling for an extended surface air-shower detector. As demonstrated by the LOPES experiment, measuring air-showers through their geosynchrotron emission has become a viable and cost-efficient method. The science case for the RASTA project - a dedicated radio array seeking to exploit this method at the South Pole - will be presented.

Auteur principal: BÖSER, Sebastian (Physikalisches Institut Universität Bonn)

Co-auteur: ICE CUBE COSMIC RAY WORKING GROUP

Orateur: BÖSER, Sebastian (Physikalisches Institut Universität Bonn)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **54** Type: **Non spécifié**

Logarithmic Periodic Dipole Antennas for the Auger Engineering Radio Array

jeudi 1 juillet 2010 12:10 (20 minutes)

Oliver Seeger for the Pierre Auger collaboration

The Pierre Auger Observatory constitutes the currently largest detector for measurements of ultrahigh energy cosmic rays through extended air showers. Radio signals originating from the shower development have been detected with suitable antennas in the 50MHz regime. The Auger Engineering Radio Array (AERA) is being established to exploit the radio technique at these high energies. The favoured antenna for the first phase of AERA is a logarithmic periodic dipole antenna (LPDA)especially designed to suit the demands of cosmic ray detection at the Auger site. This antenna is characterised by ultra broadband sensitivity in the frequency range
of 30MHz to 80MHz and allows polarisation sensitive measurements of radio signals from all incoming directions.Our characterisation of this LPDA antenna includes careful evaluation of the frequency range obtained by combining wire]based dipoles, stability and weather testing, quality assurance in the mass production process, and a benchmark measurement of the sensitivity obtained with the time dependence of the galactic radio background. For the final setup a fully calibrated radio detection system including antennas, filters and low noise amplifiers is required. We present our approach for this calibration in simulations and measurements.

Auteurs principaux: AUGER COLLABORATION; M. SEEGER, Oliver (Physikalisches Institut III A, RWTH Aachen University)

Orateur: M. SEEGER, Oliver (Physikalisches Institut III A, RWTH Aachen University)

Classification de Session: Antenna and trigger R&D

ID de Contribution: **55** Type: **oral presentation**

Advanced digital self-triggering of radio emission of cosmic rays

jeudi 1 juillet 2010 12:50 (20 minutes)

The Auger Engineering Radio Array AERA will measure the radio emission of extensive air showers. One important component of the experiment is the self trigger system, which has to overcome various sources of background signals to detect the specific short radio pulses introduced by ultra high energetic cosmic rays. The goal of the system is to reduce the original raw data rate down to a sub-Hertz coincidence trigger rate, making it possible to use WiFi communications. Although the signal pulses are spread over a wide frequency range, detection is only possible in a restricted band from 30 to 80 MHz, where man made radio background can be neglected. To suppress this background, high order analogue band filters have been developed. The talk will describe the new analogue and digital front-end electronics and compare three different approaches for the self-trigger under test by theoretical (REAS3 and MGRM) simulations and some experimental results.

Auteur principal: RÜHLE, Christoph (KIT-IPE)

Co-auteur: AUGER COLLABORATION

Orateur: RÜHLE, Christoph (KIT-IPE)

Classification de Session: Antenna and trigger R&D

ID de Contribution: **57** Type: **oral presentation**

Self-triggered detection of cosmic ray air showers at Auger with the RAuger experiment.

jeudi 1 juillet 2010 11:50 (20 minutes)

RAuger is a self-triggered and fully autonomous cosmic ray radio detection experiment installed at the Surface Detector (SD) of the Pierre Auger Observatory. Operating since July 2007, we have obtained more than 60 coincidences with Auger leading to a skymap (azimuth, zenith) showing evidence for a geomagnetic effect in the electric field emission mechanism. We also have obtained a three-fold coincidence with Auger allowing a full reconstruction of the geometry and energy estimation, in excellent agreement with the Auger SD reconstruction. These results will be of prime interest for the Auger Engineering Radio Array (AERA) project in which we are involved.

Auteur principal: REVENU, Benoit (SUBATECH, Nantes)

Orateur: REVENU, Benoit (SUBATECH, Nantes)

Classification de Session: Auger and the radio projects, reviews and results

ID de Contribution: **58** Type: **oral presentation**

Tethered Balloons for Radio Detection of Ultra-high Energy Cosmic Neutrinos in Antarctica?

mercredi 30 juin 2010 09:50 (20 minutes)

D. Besson a), R. Dagkesamanskii b), E. Kravchenko b), and I. Zheleznykh c)

a)KU, Lawrence, USA
b)PRAO LPI RAS, Pushchino, Moscow region, Russia
c) INR RAS, Moscow, Russia

Abstract

We present a brief overview of experimental efforts in Antarctica to search for radio pulses from electron-hadron cascades produced by cosmic ultrahigh-energy neutrinos in Antarctic ice. Thus far, the essential features (energy thresholds, effective recording volumes, etc.) of Antarctic neutrino radio experiments can be classified according to the deployment scheme employed: either 1. on the surface of the glacier - RAMAND-type, 2. in holes in the ice at depths of several hundred meters - RICE-type, or 3. on board stratospheric balloon, flying at an altitude of 40 km - ANITA-type. We herein propose an alternative possibility, namely to use tethered balloons for placing the radio antennas at modest (compared with ANITA) altitudes above the ice surface (1-2 km). This configuration of antennas (as compared with ANITA) will reduce the energy threshold of detection of neutrinos and increase the observation time.

Auteur principal: ZHELEZNYKH, Igor (INR RAS Moscow)

Co-auteur: KRAVCHENKO, Ilya (University of Nebraska-Lincoln)

Orateur: KRAVCHENKO, Ilya (University of Nebraska-Lincoln)

Classification de Session: Acoustic & radio, neutrino & cosmic ray detection @ South pole

ID de Contribution: **59** Type: **oral presentation**

Detection of elusive Radio and Optical emission from Cosmic-ray showers in the 1960's

mardi 29 juin 2010 14:30 (40 minutes)

In the 1960's, a small but vibrant community of cosmic ray physicists, trained in the methods and techniques of elementary particle physics and nuclear physics, pioneered new methods of detecting extensive air showers with the prime objective of searching for point sources of energetic cosmic rays. It was my personal good fortune to have been in the right place (University College Dublin) at the right time (latter half of the sixties) and to have simultaneously researched on both optical and radio detection techniques for my doctorate. It was a very exciting and challenging experience, occasionally frustrating, sometimes bordering on the heroic but, most emphatically, always chronically underfunded.

In this talk, I share my personal recollections of that early work, of people and places, reconstructed from memory, old black-and-white photographs and long-neglected research publications, all dusted off for this occasion. Of course the ultimate irony is that by the early part of the 1970's it was the collective view that little further progress was possible with radio systems utilised as stand alone shower detectors, since the emission was quite highly beamed and the effective collection area for high energy showers was possibly quite limited. Similarly, experience with attempts to exploit the optical Cerenkov emission from showers as a basis for high energy gamma-ray astronomy also proved to be pessimistic, certainly given the small light-collecting systems in use up to about 1972. By then it was time to leave the field and do other things.

However, as time moved on, new and creative people entered the field and technologies advanced rapidly, out of all proportion to what was on hand almost 50 years ago. It would have been beyond my wildest dreams in 1970, to imagine that the radio detection technique would prosper as it has, becoming such a key component in the field of experimental neutrino astrophysics. By the same token, when I returned to the optical work in 1979 as a member of the Whipple collaboration developing the Cherenkov imaging technique, I could never have imagined that TeV gamma-ray astrophysics would prosper as it has. Perhaps the moral of the talk is that one should never give up on a good idea, however great the technical issues might be.

Auteur principal: M. FEGAN, David (University College Dublin)

Orateur: M. FEGAN, David (University College Dublin)

Classification de Session: Introductory talks

ID de Contribution: **60** Type: **oral presentation**

RESUN: Radio EVLA Search for UHE Neutrinos

mardi 29 juin 2010 18:20 (20 minutes)

R.L. Mutel, T. R. Jager, K. G. Gayley
University of Iowa

We present new flux limits for UHE neutrinos derived from radio searches using a lunar target. The RESUN search used three 4-antenna sub-arrays of the Expanded Very Large Array at an observing frequency of 1.4~GHz to search for short duration Cerenkov emission from the lunar limb. Each antenna' s down-converted waveform was sampled every 10 nsec, with all pulses exceeding a 4-sigma threshold time-stamped and recorded for post-processing. For each sub-array, the data were searched for 4-antenna coincidences using differential delay windows corresponding to sources of lunar origin. We detected no coincident pulses during 250 observing hours. This implies upper limits to the differential neutrino flux $E^2dN/dE < 0.0001EeVkm$^{-2)$s^{-1}sr^{-1}and < 0.00001EeV/km2/sat90$

Auteur principal: M. MUTEL, Robert (University of Iowa)

Orateur: M. MUTEL, Robert (University of Iowa)

Classification de Session: From radioastronomy to high energy particles

ID de Contribution: **61** Type: **Non spécifié**

The Offline software package for analysis on radio emissions from air showers at the Pierre Auger Observatory

mardi 29 juin 2010 14:00 (20 minutes)

The measurement of radio emission from air showers has proven to be an invaluable source of physical information for cosmic ray physics. Apart from providing more insight into the shower mechanisms, it can be used at the Pierre Auger Observatory to increase the the accuracy of the detection of cosmic rays of 10^18 eV and above. For this purpose the Pierre Auger Collaboration is deploying the Auger Engineering Radio Array (AERA) which consists of 165 antennas covering an area of 20 km2. To reconstruct the events and to study and compare the theoretical emission models with the measurements, a detailed and precise understanding of the detector is necessary. For this reason we have built radio-functionality into the existing Offline analysis and reconstruction framework of the Pierre Auger Observatory. This presentation will discuss the philosophy and purpose of the data analysis package for AERA. Also, its functionality will be outlined, such as the reconstruction of shower parameters and the detector behavior.

Auteur principal: M. FRAENKEL, Daniel (KVI (Kernfisisch Versneller Instituut) Groningen)

Orateur: M. FRAENKEL, Daniel (KVI (Kernfisisch Versneller Instituut) Groningen)

Classification de Session: Permanent poster session - Opening day

ID de Contribution: **62** Type: **oral presentation**

The CODALEMA experiment

mercredi 30 juin 2010 17:40 (30 minutes)

After a brief history of the CODALEMA experiment set up at the radio observatory of Nançay, main performances and scientific results will be presented: detection efficiency, demonstration of the geomagnetic origin of the air shower electric field, energy calibration···At last, the future evolution of the experiment will be explained.

Summary

After a brief history of the CODALEMA experiment set up at the radio observatory of Nançay, main performances and scientific results will be presented: detection efficiency, demonstration of the geomagnetic origin of the air shower electric field, energy calibration···At last, the future evolution of the experiment will be explained.

Auteur principal: RAVEL, Olivier (SUBATECH, Nantes)

Orateur: RAVEL, Olivier (SUBATECH, Nantes)

Classification de Session: Cosmic ray radio decametric detection, signal nature and current experiments

ID de Contribution: **63** Type: **oral presentation**

Environmental effects and sensitivity of the CODALEMA experiment

mercredi 30 juin 2010 18:10 (20 minutes)

The main characteristics of the environmental influence on the performances of the CODALEMA experiment are presented. It will be shown that the performances and sensitivity of the detector are not affected by the environment and that, moreover, some interesting, side observations can be made with such an instrument. Finally, it will be shown that the new setup of CODALEMA autonomous station can reach the ultimate accessible sensitivity even in a quite noisy environment.

Summary

The main characteristics of the environmental influence on the performances of the CODALEMA experiment are presented. It will be shown that the performances and sensitivity of the detector are not affected by the environment and that, moreover, some interesting, side observations can be made with such an instrument. Finally, it will be shown that the new setup of CODALEMA autonomous station can reach the ultimate accessible sensitivity even in a quite noisy environment.

Auteur principal: GARCON, Thibault (SUBATECH, Nantes)

Orateur: GARCON, Thibault (SUBATECH, Nantes)

Classification de Session: Cosmic ray radio decametric detection, signal nature and current experiments

ID de Contribution: **64** Type: **oral presentation**

Coherent radio emission from cosmic ray air showers computed by Monte-Carlo simulation.

jeudi 1 juillet 2010 18:30 (20 minutes)

The simulation is based on the complete geometrical description of air showers generated by protons above 10 PeV. Only electrons and positrons of the air shower are considered for the electric field computation. We give random initials conditions for energy, position and angular direction to each particle, following the distributions extracted from CORSIKA simulations (S. Lafebre et al). The electric field is then computed for each secondary particle during its travel in the atmosphere using the well known equation of a moving charge which undergoes an acceleration. The total signal emitted by the air shower is per consequent the superposition of all particles contributions and it is computable for any ground position. We discuss the strategy adopted for computing a very large number of particles to approach real conditions and increase accuracy. We present the results obtained for the two horizontal polarizations of the total electric field. These polarizations are usually measured by radio detectors such as CODALEMA, LOPES, RAuger and AERA (Auger Engineering Radio Array). The characteristics and the comprehension of the radio signal emitted during such events is crucial for development of large radio detectors array.

Auteur principal: M. MARIN, Vincent (SUBATECH, Nantes)

Orateur: M. MARIN, Vincent (SUBATECH, Nantes)

Classification de Session: Air shower radio signal theory and simulations

ID de Contribution: **66** Type: **oral presentation**

Antenna development for astroparticles and radioastronomy experiments

jeudi 1 juillet 2010 12:30 (20 minutes)

An active dipole antenna is in operation since five years at Nançay (France) in the CODALEMA experiment. A new version of this active antenna has been developed, whose shape gave its name of 'Butterfly'antenna. Compared to the previous version, this new antenna has been designed to be more efficient at low frequencies, which could permit the detection of atmospheric showers at large distances. Despite a size of only 2x1 meters in each polarization, its sensitivity is excellent in the 30-80 MHz bandwidth. Three antennas in dual polarization were installed on the CODALEMA experiment, and four other have been recently installed on the Auger area in the scope of the AERA project. The main characteristics of the Butterfly antenna will be detailed with an emphasis on its key features which make it a good candidate for the low frequency radioastronomy and the radio detection of transients induced by high energy cosmic rays.

Auteur principal: M. CHARRIER, Didier (SUBATECH, Nantes)

Orateur: M. CHARRIER, Didier (SUBATECH, Nantes)

Classification de Session: Antenna and trigger R&D

ID de Contribution: **67** Type: **oral presentation**

Acoustic particle detection - from early ideas to future benefits

mardi 29 juin 2010 15:10 (40 minutes)

An overview an introductory talk on acoustic particle detection.

Auteur principal: NAHNHAUER, Rolf

Orateur: NAHNHAUER, Rolf

Classification de Session: Introductory talks