International Symposium on Very High Energy Cosmic Ray Interactions, ISVHECRI 2014

Report of Abstracts

Abstract ID : **1**

Gamma Ray Burst by blazing thin persistent precessing gamma jets

Abstract content

The Gamma Ray Burst puzzle is waiting since three decades for a solution. One shoot explosion as Fireball (or Fountain Fireball) are failing and missing many GRBs signatures, as rebrightening and X-ray precursors or hardest and late GeVs events. The proposal of a long life precessing Gamma Jets able to blaze geometrically into wide variable GRB signals as well tracing a long life hystory trail is more than ever mature and succesfull. The ability to explain the gamma and possibly a part of the UHE TeV neutrino GRB precursor is enhanced by the very peculiar (apparent) evolution of GRB with redshift, (brighter and harder), evolution naturally explained by a more aligned beaming jet via statistical larger volume arguments. The Amati correlation find a natural frame in present thin Jet model: we shall discuss the consequence for the rising UHE Neutrino Astronomy.

Summary

Gamma Ray Burst sources are apparently evolving around us in a harder and brighter samples at far and far redshift. The average output may range from a near Supernova (nearest events) output to a billion time that power for most distant events. Such a tuned evolution around us is not an anti-copernican signature. Most recent events as GRB april and september 2013 call for an unique modelling while unifying the GRB and nearest SGR sources. Very recent evidences for precessing jets nearby neutron stars will be shown and discussed in this model framework.

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Status: SUBMITTED

Submitted by **Prof. FARGION, Daniele** on **Thursday 20 February 2014**

Abstract ID : **100**

Study of the arrival direction distribution of TeV cosmic rays with ARGO-YBJ

Abstract content

Deviations from isotropy in the arrival direction distribution of cosmic rays are an important tool to understand their propagation, as they can be attributed to the interaction of cosmic-rays with the magnetic fields that they pass through, as well as to carry some memory of nearby sources. The rigidity interval between 10^{11} and 10^{13} TV is of great importance, because it corresponds to a range of distances going from the outer interplanetary space to the close interstellar medium.

ARGO-YBJ collected extensive air showers from November 2007 to January 2013, with energy threshold as low as 700 GeV. The statistics available, 5×10^{11} events, allows to investigate the problem of the anisotropy in the northern hemisphere on different angular scales, from the dipole down to $\sim 10^{\circ}$.

This contribution reports the result of the study of the cosmic-ray anisotropy with the full statistics of ARGO-YBJ.

Summary

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Status: SUBMITTED

Submitted by **IUPPA, Roberto** on **Tuesday 03 June 2014**

Abstract ID : **11**

Informations From Very High Energy Leptons Contained in Extensive Air Shower Cores

Abstract content

The production of very high energy leptons generated near the earliest hadronic collisions, mainly after the decay of pions and kaons at high altitude has been simulated for energies of primary particles (proton, neutron, heavy nuclei) in an energy range 10^{5-11} GeV. The energy threshold for VHE leptons arriving at various altitudes (from YBJ at 4300 m a.s.l down to sea level) is taken for energies 10, 50, 100 GeV and the behavior of the cascades is also simulated for very inclined showers comparing in a few cases incidences with fixed zenith and azimuthal angles.
A special attention is given to positive and negative muons in order to distinguish the μ^+/μ^- charge ratio (and in parallel to ratios of neutrinos and antineutrinos), inversed in the case of protons and neutron primaries with primary energies up to 10^{17} eV. We explore the most favorable conditions to measure possible signals emerging from the general cosmic ray background indicating showers initiated by primary neutrons. The data is analyzed in order to evaluate the signature of neutrons emitted from close pulsars or other astrophysical sources at distances going from 1 pc up to 2 kpc (including sources like , Geminga, Crab, Vela, Cygnus X1, G.C...). To point out signal measurable by existing arrays with a reasonable statistics, we observe the effects of different parameters important in the collimation of expected beams:

- Primary energy range , source distance, lepton energy threshold
- Zenith and azimuthal angles
- Geomagnetic field

At ultra high energy, the simulated data are used to estimate the background of PeV neutrinos generated in giant EAS against possible astrophysical neutrinos.

Summary

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POSTER SESSION

Status: SUBMITTED

Submitted by **TALAI, Mohamed Cherif** on **Friday 02 May 2014**

Abstract ID : **13**

Radio Signal Correlation at Frequency 32 MHz with Extensive Air Showers Parameters Using Yakutsk Array Data in the Energy Range of 10^{16} – 10^{19} eV.

Abstract content

The study of cosmic rays with the help of radio detection from extensive air showers may be an alternative to traditional detecting methods, which use a large area array installed with hundreds and thousands of scintillation detectors for charged particles, or the detectors of measuring the emission produced by relativistic particles of EAS in the optical wavelengths. Processes that lead to the emission of electromagnetic radiation are well known and calculations show that the air shower radio emission depends on the processes of development of the electromagnetic cascade, i.e. related with the longitudinal development of the shower, with the magnetic field near sea level etc. In this regard, there is a question to establish the correlation between characteristics of EAS both longitudinal and lateral development and radio emission parameters observed when air shower particles passes through the atmosphere. For this purpose, in Yakutsk, radio array for detecting air shower radio emission was established. The array consists of the antenna field on which crossed antennas are installed, antennas oriented E - W and N - S. Radio emission measurements are conducted at frequency 32 MHz, free from industrial noise. In 2008 - 2013 years, Yakutsk array has measured several seasons of registration of EAS events, including showers with energies above 10^{19} eV.

In the course of the data analysis the following results were obtained: a) lateral distribution of the radio signal plotted as a function of distance from the shower axis; b) a correlation between the amplitude of the radio signal with the energy of the shower, which is determined by measuring the fluxes of charged particles, muons and EAS Cerenkov radiation (energy balance method); c) we made evaluation of the depth of maximum development of the shower using form of radio emission LDF measured in ultra-high energy showers; g) we made a comparison of the Yakutsk array data with data from other arrays.

Summary

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Status: SUBMITTED

Submitted by **PETROV, Igor** on **Tuesday 06 May 2014**

Abstract ID : **15**

Wide field-of-view Cherenkov telescope for the detection of cosmic rays in coincidence with the surface detectors of the extensive air shower array

Abstract content

The Yakutsk array group is developing the wide FOV Cherenkov telescope to be operated in coincidence with the surface detectors of the extensive air shower array. Currently, the engineering prototype of the reflecting telescope with the front-end electronics is designed and assembled to demonstrate the feasibility of a conceived instrument. The status and specifications of the prototype telescope are presented, as well as the modernization program of the Cherenkov light detectors subset of the array measuring ultra-high energy cosmic rays.

Summary

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Status: SUBMITTED

Submitted by **TIMOFEEV, Lev** on **Thursday 08 May 2014**

Abstract ID : **16**

About knee origin in CR spectrum.

Abstract content

The results of measuring of thin structure in a cosmic rays (CR) spectrum in the energy range 1015 - 1018 eV comes into conflict with the model of a sharp break in a spectrum at energy 3•1015 . These data more likely indicate that the contribution of the single close source to CR flow takes place. The experimental data about CR anisotropy support this statement. The model is discussed in which earlier observed the abnormal characteristics of muon and hadron EAS components at the same energies are considered as results of radiation of a single source. The possibility that this source is a quark star is considered.

Summary

1.The thin structure of EAS spectrum was studied by HADRON installation (TienShan). Its singularity consists in a number of characteristics: high altitude in atmosphere, small distance between EAS detectors (7 m), high accuracy of EAS axis definition (0.2 m) by means of a carpet of the ionization chambers allocated criss-cross, and relatively high dynamic range of electronics (> 104). This has allowed to select correctly the contribution to EAS spectrum of abnormal narrow showers (s <0.4). Previously we have shown that part of such showers sharp increases from 5% to ˜50% at energy range 1016-1017 eV. It is obviously possible that difference in effectiveness of the registration of such showers by different installations is a principal cause of CR spectra form vary (around 1017 eV) from one experiment to another . 2. The comparative analysis of the last measurements of CR spectra confirms conclusion about presence of a singularity of type bump or ledge around 1017 eV . Power form of CR spectrum with a few bumps in the range 1015-1018 eV pointed to double composition of CR where one component is a contribution of the single close source to CR flow. The change of galactic phase of CR flow anisotropies from center to anti-center (˜180°) indicates arise of a new CR source for PeV energies. 3. Usage X-ray emulsion chamber as EAS core detector in experiment HADRON has allowed to obtain a new information which indicates to presence of showers with the abnormal properties. The simultaneous increase of muon numbers and energies of TeV gamma-quanta ($\pi 0$) in showers fail to explain by standard models of development of nuclear-electromagnetic showers in an atmosphere. If two-component model of CR flow is true then abnormal showers need to connect with the single close source which may be quark star that case.

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Status: SUBMITTED

Submitted by **SHAULOV, Sergey** on **Sunday 11 May 2014**

Abstract ID : **17**

Simulation of low energy cosmic rays fluxes at balloon-borne altitude

Abstract content

During the last decade, balloon-borne experiments dedicated to more and more detailed measurements of low energy cosmic rays have achieved important progress : new challenge in solar physics and dosimetry, search for signals of dark matter in cosmic rays and diffuse gamma rays at higher energy, search for antimatter or consistency of the “leaky box” model, etc. New candidates enlarging the multiplicity of cosmic ray sources have motivated an important effort on sophisticated instruments. Important data of high quality have been recorded by the balloon-borne missions such as BESS and BESS-polar, ATIC, CREAM, CAPRICE or RUNJOB, under small ranges of atmospheric thickness between 2g/cm2 up to 20 g/cm2 in the case of important zenith angles and various float altitudes. Therefore, we have started new calculations implying different options of CORSIKA. Considering the convergence of several measurements of particles energy spectra with large statistics under 100 GeV/c, we have used this energy band to testify the predictions for the models of p-air and A-air interactions implemented in CORSIKA. For projectile hadrons of energies lower than 100 GeV, the cascades of secondaries are completely reproduced by the hadronic interaction generators GEISHA, UrQMD, FLUKA. For secondary particles with energy exceeding 5 GeV, the comparison becomes more complicated by the combination with different high energy collision Monte Carlo generators (operating above 80 GeV), QGSSJet, SYBILL, DPMJet, EPOS and we have extended hybrid simulations up to 10 TeV. The fluxes obtained for positive and negative electrons and muons, photons, p, p-bar, n, n-bar are produced according to suitable inputs of primary spectra, i.e. local interstellar spectrum (LIS) modulated by the force field model when the solar modulation cannot be neglected.

Summary

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Comments:
Poster presentation.

Status: SUBMITTED

Submitted by **DJEMIL, Taoufik** on **Sunday 11 May 2014**

Abstract ID : **19**

New Approach for Experimental Investigation of the Nature of the Knee with the GAMMA Experiment

Abstract content

The preliminary experimental results obtained by a new diffusion-difference method for the study of the nature of the knee in the energy spectrum of the primary cosmic radiation are presented. The main distinction of this method from the other ones is a study of the difference in characteristics of extensive air showers arriving from two opposite directions of the sky, but not of their intensity. Using this method for the analysis of the age parameter S of the extensive air showers in the knee region the statistically strong maximum of the difference is observed for the direction towards the local source in the Southern hemisphere of the sky (Vela). This excess is registered with the GAMMA installation on the Mt. Aragats in Armenia for the showers with a younger age compared with that for showers from the opposite direction. Subtraction of the excess partly decreases sharpness of the knee but doesn't remove it completely. Study of shower characteristics using the diffusion-difference method demonstrated its simplicity, high sensitivity and ability to scan the whole sky by the installation with limited observation angles in the laboratory coordinate system.

Summary

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Status: SUBMITTED

Submitted by **MARTIROSOV, Romen** on **Monday 12 May 2014**

Abstract ID : **2**

Investigation of Hadrons Anti-Hadrons Production in Relativistic Heavy Ion Collisions on two common event generators

Abstract content

The study of hadrons production in heavy ion collisions provides the researcher with a valuable techniques to investigate the properties of quark gluon plasma (QGP). The hadrons and anti-hadrons production at the relativistic heavy ion collisions are modeled by using the current available data of the experiments at the LHC and RHIC. In order to test the used models for the hadrons and the anti-hadrons production are based on Monte Carlo techniques.

Summary

hadrons and the anti-hadrons production based on Monte Carlo techniques.

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Status: SUBMITTED

Submitted by **SALEH, Sayed** on **Tuesday 08 April 2014**

Abstract ID : **21**

Atmospheric neutrino fluxes at high energies depending on hadronic models

Abstract content

Summary
High-energy neutrinos from decays of mesons, produced in collisions of cosmic-ray particles with air nuclei, form unavoidable background for astrophysical neutrinos. More precise calculations of the high-energy neutrino spectrum are required since measurements in the IceCube experiment reach the intriguing energy range where a contribution of the prompt neutrinos and/or astrophysical ones should be uncovered.
We give the comparison of the calculated atmospheric neutrino energy spectra with the data obtained recently with in IceCube and ANTARES experiments. Calculations of atmospheric fluxes of muon and electron neutrinos in the energy range 100 GeV - 10 PeV are made using known hadronic models, QGSJET, SIBYLL, and Kimel & Mokhov. The computation is performed for parametrizations of cosmic ray spectra in the wide energy range including the knee region: polygonato model, Zatsepin & Sokolskaya, Hillas & Gaisser.
In the computation, we employ a semianalytical approach to describe the hadron-nucleus cascade induced by cosmic rays in matter. The method allows to acount the nonpower law energy spectrum of the primary cosmic rays, the violation of Feynman scaling, and the growth of the total inelastic cross sections for hadron-nucleus collisions with increasing energy. All calculations are compared with the atmospheric neutrino measurements by Frejus, AMANDA, IceCube and ANTARES. The prompt neutrino flux predictions obtained with the quark-gluon string model (QGSM) for the charm production by Kaidalov & Piskunova do not contradict to the measurements and upper limits on the astrophysical muon neutrino flux obtained with neutrino telescopes.
The diffuse flux of astrophysical neutrinos related to the PeV neutrino events in the IceCube experiment may lead to a decrease of the neutrino flavor ratio, $(\nu_\mu + \bar{\nu}_\mu)/(\nu_e + \bar{\nu}_e)$, at the energy above 10 TeV. An extrapolation of the IceCube diffuse PeV neutrino flux to the energy range below 30 TeV shows the consistency of calculated neutrino flavor ratio and that of obtained from from the IceCube data. The computation makes it clear that confirmation of astrophysical origin for high-energy neutrino events might be obtained from little progress in measurement of AN ν_e spectrum above 10 TeV, because the flavor ratio, sensitive to the ν_e component, allows to reveal a small contribution from astrophysical sources.
Presentation type –poster–
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Status: SUBMITTED

Submitted by **SINEGOVSKY, Sergei** on **Tuesday 13 May 2014**

Abstract ID : **23**

Air shower universality: solutions toward unambiguous primary composition evaluation from hybrid ground-based observations

Abstract content

The universality in extensive air shower development expressed by means of scale-invariant lateral distribution of electrons and the relation between radial scale factor and shower age is investigated. It is shown that, despite some limitations, generalized universality could be an important tool for hybrid ground-based experiments, especially using the potential of low-energy extentions of giant arrays. Efficiency of the approach for primary composition studies in wide primary energy range both on average and event-by-event basis with reducing of the influence of hadronic model uncertainties, instrumental and data processing biases is discussed.

Summary

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Status: SUBMITTED

Submitted by **RAIKIN, Roman** on **Wednesday 14 May 2014**

Abstract ID : **24**

Modeling of secondary cosmic ray spectra for 23 and 24 Solar Cycles

Abstract content

The SecondaryCR model evaluates secondary particles spectra of electrons, positrons, muons, gammas, protons, neutrons, etc. in the Earth atmosphere at different positions, altitudes and times during the 23rd and 24th solar cycles. We combine the model of secondary cosmic rays production in the Earth's atmosphere from existing models evaluating particles transport in heliosphere and magnetosphere and Corsika model for interaction of primary cosmic rays with the atmosphere. For evaluation of spectra at 1AU on magnetopause we use mainly the results of HelMod model. Transparency of magnetosphere was obtained by GeoMag model. The comparison of muon spectra evaluated by SCR model with BESS measurement is presented. Neutrons spectra for solar minimum and maximum condition for neutron monitors of NMDB network were evaluated.

Summary

We combine model of secondary cosmic rays production in the Earth's atmosphere from existing models evaluating particles transport in heliosphere and magnetosphere andCorsika model for interaction of primary cosmic rays with the atmosphere. Model result in the form of catalog are presented at secondaryCR.org.

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Status: SUBMITTED

Submitted by **PASTIRCAK, Blahoslav** on **Wednesday 14 May 2014**

Abstract ID : **25**

High energy positrons fraction in the anomalous diffusion model

Abstract content

The observed increase of the positron fraction $e^+/(e^+ + e^-)$ for energy $E > 10$ GeV, firstly detected by the PAMELA collaboration and confirmed with higher precision by the Fermi-LAT and AMS-02 data, has stimulated the development of new theoretical approach for explanation of this phenomenon. We perform an analysis of the experimental data on high energy positrons, in the framework of the anomalous diffusion model. The anomaly in this model is related to the nonlocal nature of the particles diffusion process in a turbulent (fractal) Galactic medium. The key provision of the presented research is that the both positrons and electrons are injected into the interstellar medium by the sources with the same spectral exponent $p \sim 2.8$.

We obtain a good agreement between our modeling and the experimental data in the whole energy range. We have also found that the positrons fraction increases to a constant value of ~ 0.2 above to energy $E = 300$ GeV.

Summary

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Status: SUBMITTED

Submitted by **VOLKOV, Nikolay** on **Wednesday 14 May 2014**

Abstract ID : **26**

The analysis of fake trigger events background in planned JEM-EUSO experiment

Abstract content

The JEM-EUSO is an Extreme Energy Cosmic Rays experiment whose main purpose is the study of the End of Cosmic Rays spectrum above the GZK cut-off. The detector is basically a large field of view UV camera, pointing toward the earth atmosphere, to detect and measure the fluorescence light imprint produced by development at speed of light of Extensive Air Showers. The background photons are much more than those of signal. Therefore the background reduction is essential for such space observatory of EECRs. The goal of the trigger system is to detect the occurrence of scientifically valuable signal among very huge background noise detected by JEM-EUSO telescope.

The UV background registered by JEM-EUSO is randomly distributed. We study if these random processes produce fake patterns, which could be mistakenly interpreted as extreme energy cosmic rays events. For this purpose very huge amount of measurements on photo detection module with only detector noise were simulated. To distinguish between such simulated fake events and real extreme energy cosmic rays events we have applied several pattern recognition methods. We present here the simulated results, their analysis and comparison of different pattern recognition methods.

Summary

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Status: SUBMITTED

Submitted by **PASTIRCAK, Blahoslav** on **Wednesday 14 May 2014**

Abstract ID : **3**

Higgs Production in Relativistic Heavy ion Collisions Using Monte Carlo Techniques

Abstract content

The yield of Higgs particles in Relativistic Heavy Ion Collisions is very low (˜ 21 events in 109 events). The Simulations of these events are based on available theoretical models of elementary particle productions (like Standard Model (SM)) and the models concerning the medium of the quark gluon plasma, require a huge computational resources to produce a large number of events adequate to study the Higgs production. The available event generators based on the Monte Carlo Techniques, like PYTHIA8.180 and SCHERPA, are investigated in order to generate Higgs Hard Events. The toy event generator produces only events containing statistically weighted Higgs Bosons with a possibility of the experimental cuts on the produced particles have been developed. A comparison of the obtained results with the published experimental data are carried out to refine the toy model.

Summary

Simple Toy Model For Higgs Production in SM.

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Status: SUBMITTED

Submitted by **SOLEIMAN, Mohammed** on **Tuesday 08 April 2014**

Abstract ID : **30**

Atmospheric lepton fluxes in ANflux

Abstract content

Atmospheric muons and neutrinos constitute the main background for experiments like ANTARES or IceCube. It is therefore important to determine these fluxes as precisely as possible and quantify the systematic uncertainties of different interaction and primary models and to make these calculations available to experimenters.
We present the tool "ANflux", which is intended to give a fair representation of the atmospheric lepton fluxes calculated with different interaction models in a smooth and easily accessible way. To achieve this goal ANflux combines existing CORSIKA MC simulation data with a numerical solution of the coupled cascade equations. In order to allow access in a smooth fashion, the combined datasets are interpolated with smoothed B-splines, taking into account the energy and zenith dependence of the flux. Both tabulated fluxes and spline coefficients are stored in HDF files.
ANflux contains several recent models of the primary CR flux, secondary fluxes calculated with two different interaction models (QGSJET-II-03 and Sibyll 2.1) as well as the charmed contribution calculated with QGSJET-01C. The contributions to the lepton fluxes are separated according to the intermediary meson (i.e. Pion or Kaon) in order to provide a handle on one of the key systematic uncertainties of the neutrino flux. ANflux will be made for available for public use in the near future, it is written with extensibility in mind and calculations will be added as new interaction models become available.

Summary

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Status: SUBMITTED

Submitted by **SCHÖNEBERG, Sebastian** on **Wednesday 14 May 2014**

Abstract ID : **31**

Estimation for primary energy spectrum by considering iron nuclei with a mini array method

Abstract content

Observation experiments of Cosmic rays have been carried out since 1996 in Okayama University of Science, the primary energy spectrum in energy range of 10^{16}eV to $10^{19.5}$eV has been obtained by using a mini array consist of 8 plastic scintillation counters and an extensive air shower (EAS) time structure since 2006.
In this presentation, we report on results of EAS simulations and data analysis for the primary energy estimation by taking account into primary proton and iron nuclei, because primary particles had been assumed to be proton nuclei in simulations and data analysis for the primary energy estimation.

Summary

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Status: SUBMITTED

Submitted by **MATSUMOTO, Hiroki** on **Wednesday 14 May 2014**

Abstract ID : **32**

Extensive air shower direction reconstruction in the HiSPARC experiment

Abstract content

HiSPARC cosmic-ray stations are located on the roofs of high schools and research institutes. They form a network for the detection of extensive air showers. The geographical distribution of the stations is highly irregular. For the reconstruction of shower direction we distinguish two situations: exactly three stations hit by the shower and four or more stations hit by the shower. For each case we will outline the method applied. An analytical function is derived for three stations at different altitudes. The situation with more stations is analyzed with a best fit procedure. Each HiSPARC station consists of two or four scintillators with a PMT for readout. A GPS module is used for timing and accurate position determination. PMT signals are sampled every 2.5 ns to provide good timing resolution. The instrumental setup and the timing measurement will be described. The performance of a single station was tested at the KASCADE experiment. CORSIKA is used to verify the accuracy of the shower reconstruction. The network started taking data in 2004. Reconstruction results using all available data will be presented.

Summary

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Status: SUBMITTED

Submitted by **DE LAAT, Arne** on **Wednesday 14 May 2014**

Abstract ID : **34**

Measurement of Elliptic Flow in a Stratospheric Nuclear Interaction at 10^{16} eV

Abstract content

107 cascades, produced in a nuclear interaction at 10^{16} eV, were detected in a stratospheric emulsion chamber. Their azimuth distribution reveals a distinct anisotropy. Estimation of the elliptic flow coefficient v_2 gives a value of 0.41 ± 0.17

Summary

Primary author(s) : Prof. DALKAROV, O. D. (LPI); KOTELNIKOV, Konstantin (LPI)

Co-author(s) : Prof. GRICHINE, V. M. (LPI); Dr. KOTELNIKOV, S. K. (LPI)

Presenter(s) : Prof. DALKAROV, O. D. (LPI)

Comments:

Key words: high-energy, nuclear interactions, elliptic flow

Status: SUBMITTED

Submitted by **KOTELNIKOV, Konstantin** on **Wednesday 14 May 2014**

Abstract ID : **35**

Detection of high energy electromagnetic component of the air-shower core by scintillation counters in the hybrid experiment "Pamir XXI"

Abstract content

Chacaltaya hybrid experiment has shown that no model of the current simulations can describe well the observed characteristics of three components in the air-showers, i.e., air-shower size, burst-size and accompanied family energy, detected by the experiment. The observed characteristics of the events are well described, in appearance, by the simulation using current interaction models. However, if the events are divided into two groups, with family and without family, the simulation fails to describe characteristics of both groups of data. Thus the information on the atmospheric families detected by emulsion chambers is a key ingredient for understanding the characteristics of the cosmic-ray interactions in the energy range of $10^{15} \sim 10^{17}$eV. The number of events with atmospheric family are still very small and it is necessary to get at least ten times more family events to make the argument clear. However, the measurement and analysis of family data using the emulsion chamber are very time-consuming work. It is preferable to use scintillator counters instead of X-ray films at the suitable depth of the lead plates to detect high energy atmospheric families in the future large scale hybrid experiment. Here we study a possibility to use scintillator detectors for detecting high energy atmospheric families instead of using emulsion chamber in the new comprehensive EAS experiment “Pamir XXI”.

Summary

Primary author(s) : Dr. TAMADA, Masanobu (Kinki University)

Co-author(s) : Dr. INOUE, Naoya (Sitama University); Dr. OHSAWA, Akinori (ICRR, University of Tokyo); Dr. SEMBA, Hiroshi (Urawa University); Dr. MISAKI, Akeo (Saitama University)

Presenter(s) : Dr. TAMADA, Masanobu (Kinki University)

Status: SUBMITTED

Submitted by **TAMADA, Masanobu** on **Wednesday 14 May 2014**

Abstract ID : **36**

Algned interactions in Cosmic Rays

Abstract content

The first clean Centaur was found in cosmic rays years ago in Mt Chacaltaya. Since that time, many people have tried to find this type of interaction, both in cosmic rays and accelerators. But no one found clear cases of this type of interaction. It happened in the last exposure of emulsion at Mt Chacaltaya. The experimental data for both the Centaurs will be presented and discussed. We also present our comments to the intriguing question of the existence of a type of nuclear interactions aligned at high energy.

Summary

Primary author(s) : Prof. KEMPA, Janusz (Warsaw University of Technology Branch Plock)

Co-author(s) : Prof. TAMADA, Masanobu (Kinki Uniersity); Dr. RUMIANOWSKI, Roman (Warsaw Univesrity of Technology Breanch Plock)

Presenter(s) : Prof. KEMPA, Janusz (Warsaw University of Technology Branch Plock)

Status: SUBMITTED

Submitted by **KEMPA, Janusz Jerzy** on **Wednesday 14 May 2014**

Abstract ID : **39**

Cosmic ray energy reconstruction from the S(500) observable recorded with the KASCADE-Grande experiment

Abstract content

Two methods are applied independently at KASCADE-Grande to reconstruct the primary energy of cosmic rays for the detected air showers. The standard reconstruction technique is based on a correlation between the total shower size and the muon size. We present a second method to reconstruct the primary energy of cosmic rays by means of the charged particle densities inferred with the KASCADE-Grande detector at 500 m distance from the shower axis, S(500). In this method we account for the attenuation of inclined showers by applying the Constant Intensity Cut method and we employ a simulation derived calibration to convert the recorded S(500) into primary energy. An unfolding is applied to the result to account for statistical fluctuations and systematic effects. We observe a systematic shift of the S(500)-derived energy spectrum in relation to the earlier published result of the standard reconstruction technique. A comparison of the two methods on simulated and measured data shows that this shift appears only for measured data and it is caused by the way simulations describe the shape of the lateral density distribution.

Summary

We present a method to reconstruct the primary energy of cosmic rays by means of the charged particle densities inferred with the KASCADE-Grande detector at 500 m distance from the shower axis.

Primary author(s) : Dr. TOMA, Gabriel (IFIN-HH)

Co-author(s) : KASCADE-GRANDE, Collaboration (NA)

Presenter(s) : Dr. TOMA, Gabriel (IFIN-HH)

Comments:
I would like to contribute with a poster presentation.

Status: SUBMITTED

Submitted by **TOMA, Gabriel** on **Wednesday 14 May 2014**

Abstract ID : **4**

Origin of TeV gamma-rays in Perseus galaxy Cluster

Abstract content

The cluster of galaxies in Perseus, along with other clusters, have long been considered as possible candidates for the sources of high and very high energy gamma-ray emission generated by various mechanisms. Long-term studies of the central galaxy in the cluster, NGC 1275, are being carried out in the SHALON experiment. We presented the results of fifteen-year-long observations of the AGN NGC 1275 at energies 800 GeV–40 TeV discovered by the SHALON telescope in 1996. The data obtained at very high energies, namely the images of the galaxy and its surroundings, and the flux variability indicate that the TeV gamma-ray emission is generated by a number of processes: in particular, part of this emission is generated by relativistic jets in the nucleus of NGC 1275 itself. Whereas, the presence of an extended structure around NGC 1275 is evidence of the interaction of cosmic rays and magnetic fields generated in the jets at the galactic center with the gas of the Perseus cluster.

Summary

Primary author(s) : SINITSYNA, Vera Georgievna (P)

Co-author(s) : SINITSYNA, Vera Yurievna (P.N. Lebedev Physical Institute)

Presenter(s) : SINITSYNA, Vera Georgievna (P)

Comments:
Oral

Status: SUBMITTED

Submitted by **SINITSYNA, Vera Georgievna** on **Wednesday 16 April 2014**

Abstract ID : **40**

Simultaneous, multiple and parallel EAS events due to cosmic ray heavy nuclei observed by Large Area Air Shower Experiments(LAAS).

Abstract content

Cosmic ray heavy nuclei above the KNEE energies are going to be observed as multiple, parallel and simultaneous EAS events at EAS arrays scattered over hundred square kilometer area, because their photo-disintegration process with solar photons has created multiple fragment nuclei, protons and neutrons. To observe them, the Large Area Air shower experiments deployed the EAS arrays in the 5 university and institute in Japan. They has GPS disciplined 10 MHz oscillator which provides the UTC time stamp for each EAS event within a few microsecond accuracy. Searching for simultaneous and parallel EAS events at multiple EAS observatories have been carried out by comparing EAS arrival time and direction within several baseline combinations of EAS arrays. The EAS events of which time differences and angular distances were less than several millisecond and less than fifteen degrees respectively, have been selected. In this presentation, we are going to show their angular distances from the solar direction and the lunar direction of EAS events.

Summary

Primary author(s) : Prof. IYONO, Atsushi (Dept. of Fundamental Science, Okayama University of Science)

Co-author(s) : MATSUMOTO, Hiroki; Prof. TAKAHASHI, Nobusuke (Dept. of Physics, Hirosaki University); Dr. TSUJI, Shuhei (Kawasaki Medical School); Dr. OKEI, Kazuhide (Kawasaki Medical School); Prof. OHARA, Soji (Nara Industrial University); Dr. OCHI, Nobuaki (Toyo University); Mr. WADA, Naoki (Graduate School of Science, Okayama University of Science)

Presenter(s) : Prof. IYONO, Atsushi (Dept. of Fundamental Science, Okayama University of Science)

Status: SUBMITTED

Submitted by **IYONO, Atsushi** on **Thursday 15 May 2014**

Abstract ID : **47**

Future operation of LHCf at LHC p-p,$\sqrt{s}$=13TeV

Abstract content

The Large Hadron Collider forward(LHCf) experiment dedicates to measure the neutral particles emitted in the very forward region of LHC collisions.The purpose is to afford the data for verifying and improving the hadron interaction model that play an important role on the ultra-high-energy cosmic rays physics. LHCf will have a operation at the LHC design energy, $\sqrt{s}$=13TeV in April 2015. The operation is for 1 week with very low luminosity, and with collaborating with the ATLAS experiment. The common data-taking with ATLAS gives central information to help LHCf identifying the diffractive events. we design the trigger system on LHCf side for the common operation. The LHCf detectors are upgraded with replacing the scintillators to GSO crystal scintillators which are radiation-harder than plastic scintillators.

Summary

Primary author(s) : Mr. ZHOU, Qidong (Nagoya university)

Presenter(s) : Mr. ZHOU, Qidong (Nagoya university)

Comments:

I am s master student from nagoya university, so i would like to have poster presentation. Because we have a lot of members of our collaboration, sorry about i did not write our collaboration members' name.

Status: SUBMITTED

Submitted by **ZHOU, Qidong** on **Thursday 15 May 2014**

Abstract ID : **5**

Very high energy gamma-emitters in the Cygnus Region

Abstract content

Cygnus Region contains the number of powerful sources of radio and X-ray emission which are, also, supposed as a potential TeV-emitting objects. One of them is the massive binary system Cyg X-3. The results of seventeen-year observations of the Cyg X-3 at energies 800 GeV – 85 TeV, detected by the SHALON telescope in 1995 are presented with spectral energy distribution, images and integral spectra. A number of high activity period of Cyg X-3 were detected with SHALON at energies > 800 GeV during the all period of observation since 1995y. The last two significant increase of very high energy gamma-quantum flux have detected in May 2009 and October 2011, which is correlated with flaring activity at lower energy range of X-ray and/or at observations of Fermi LAT. Also, we present the results of long-term observations of the Cygnus region around Cyg X-3 which are revealed the gamma-ray emission from the one of nearby object - γ Cygni SNR of shell-type, placed at ˜2° from Cyg X-3. The results of γ Cygni SNR observation by SHALON are presented with spectral energy distribution, images and integral spectra at energies 800 GeV – 50 TeV.

Summary

Primary author(s) : SINITSYNA, Vera Yurievna (P)

Co-author(s) : SINITSYNA, Vera Georgievna (P)

Presenter(s) : SINITSYNA, Vera Yurievna (P)

Comments:
Oral

Status: SUBMITTED

Submitted by **SINITSYNA, Vera Yurievna** on **Wednesday 16 April 2014**

Abstract ID : **51**

Total inelastic p-air cross-section from a mini-jet model with infrared gluon resummation

Abstract content

We study proton-proton cross-sections at very high cosmic ray energies from an eikonal mini jet model with infrared gluon resummation. This model is able to reproduce the present TOTEM data for pp cross-sections, and we extend it to the case of the total inelastic p-air cross-section. The results are compared with published AUGER data and with an empirical parameterization for total pp cross section.

Summary

Predictions for the inelastic p-air cross-section are presented, using a model previously applied to proton-proton scattering.

Primary author(s) : Dr. PANCHERI, Giulia (INFN Frascati National Laboratories)

Co-author(s) : Prof. GRAU, Agnes (University of Granada, Physics Department); Dr. SHEKHOVTSOVA, Olga (Institute of Nuclear Physics PAN, Cracow, Pl); Prof. SRIVASTAVA, Yogendra Narain (Uniersity of Perugia, Physics Department); Mr. FAGUNDES, Daniel Almeida (UNICAMP)

Presenter(s) : Dr. PANCHERI, Giulia (INFN Frascati National Laboratories)

Status: SUBMITTED

Submitted by **PANCHERI, Giulia** on **Thursday 15 May 2014**

Abstract ID : **52**

Measurements of the attenuation length in salt mines at radio frequencies

Abstract content

Neutrinos are weakly interacting particles that cannot be detected directly. Their properties are deduced by analyzing their interaction products. One detection method for cosmic neutrinos was proposed by Askaryan. He suggested that if a neutrino interacts within a volume of dielectric, it will produce a broadband radio electromagnetic field that can be measured. The medium should be transparent to the produced waves to ensure large propagation distances. Thus salt in salt mines (with a theoretical low dielectric permittivity and high purity) can serve as the detecting medium for radio waves. The radio waves produced at neutrino's interaction point by Askaryan effect travel through salt, so the propagation medium has a huge impact on measurements and results. The properties of the medium can be described by the "attenuation length", i.e. the distance into a material when the field intensity has dropped to 1/e of its initial value. In this work we present measurements of the attenuation length at multiple radio frequencies. Measurements were carried out at "Slanic Prahova" salt mine (Romania). The main implications of a cosmic neutrino detector are also discussed.

Summary

Primary author(s) : BADESCU, Alina (UPB)

Co-author(s) : Dr. BRANCUS, Iliana (IFIN-HH); Dr. MITRICA, Bogdan (IFIN-HH); Dr. STANCA, Denis (IFIN-HH); NICULESCU-OGLINZANU, Mihai (IFIN-HH); SAFTOIU, Alexandra (IFIN-HH); TOMA, Gabriel (IFIN-HH); GHERGHEL-LASCU, Alexandru (IFIN-HH); Dr. HAUNGS, Andreas (KIT)

Presenter(s) : BADESCU, Alina (UPB)

Status: SUBMITTED

Submitted by **BADESCU, Alina** on **Thursday 15 May 2014**

Abstract ID : **53**

Electron showers and subsequent Chrenkov light yields due to high energy muon struggling based on the Time Sequential Procedure

Abstract content

We have proposed a fundamental theory based on the Monte Carlo Time Sequential Procedure for the range fluctuations of high energy muons which has been acepted for publicstion (May 20,12014)in the AStroparticle Physics. The fundamental theory may be the complementary one to the standard procedure developed by Lipari and Stanev which has been widely utlized in the analysis of high energy neutrino astrophysics with the use of KM3 detectors like IceCube. Based on the Time Sequential Procedure developed by the authors, we investigate electron showers and subsequent Chrenkov light yields due to the high energy muons and discuss the fluctuations of those physical wuantities due to high energy muons. Concreteley speaking, we give the fluctuations around the transition curves for the Chrenkov light yiels and their wave forms for indidual high energy muons. Furthermore, we give the realations between the neutrino spectrum and the corresponding muon spectrum for diffrent zenith angle at the oposite sides of the Earth to the incident direction s of the neutrinos.

Summary

Primary author(s) : Prof. MISAKI, Akeo (Saitama University)

Co-author(s) : Prof. TAKAHASHI, Nobusuke (Hirosaki University); Dr. OKUMURA, Yoshihide (Hirosaki University)

Presenter(s) : Prof. MISAKI, Akeo (Saitama University)

Comments:

We would like to present our results orally. Because, our procedure is practically new one for the resaercheres who are engaged in the analysis of high energy neutrino events by using the procedure developed by Lipari and Stanev which have been adopted as the standard procedure. Our oral resentaion semms to be quite useful for active discussion between the analysists bsed on Lipari and Stanev , the standard one, and us based on the diffrent principlle.

Status: SUBMITTED

Submitted by **MISAKI, Akeo** on **Thursday 15 May 2014**

Abstract ID : **58**

ONE POSSIBLE WAY TO OVERCOME THE GZK-LIMIT IN UHECR: APPROXIMATE EXTENSION OF LORENTZ SYMMETRY UP TO CONFORMAL ONE

Abstract content

During more than a half of the century in the astrophysics of ultra-high energy cosmic rays (UHECR) there exists the so-called Greisen – Zatsepin – Kuzmin (GZK) problem [1,2]. According to these papers, the energy distribution of the primary proton component of the UHECR should end abruptly in the region of energies of GZK-limit ≈ 5•1019 eV due to the loss of proton's energy in the reaction of pions photoproduction p+γ→p+π0 and/or p+γ→n+π+ (with subsequent decay n→p+e−+νe), where γ's belong to the cosmic background radiation (CBR). But experimentally the status of GZK-limit is yet unclear up to our days (see, e.g., the recent review [3]), but in any case the possibility of it's violation is by no means excluded – moreover, it is highly expected. Thus, for a long time – namely, starting from the seminal work by Kirzhnitz and Chechin [4] (see also Coleman and Glashow [5] and more recent papers [6,7]) – there were made attempts to find some possibilities to overcome the GZK-limit. According to [4], this aim may be achieved by slightly deformation of the standard relativistic kinematics at very high values of the dimensionless Lorentz factor γ=E/E0≈1010÷1011, where in our case E0≈1 GeV. But in [4] this approach was formulated only on the purely phenomenological level, so the aim of the present work is to supply the approach in [4] by more sophisticated mathematical foundation. To this end we propose to consider the Lorentz kinematics deformation as the account of the so-called conformal corrections in powers of 1/γ«1, which are completely absent for the massless particles with E0=0 (and thus 1/γ=0), which are strictly conformally invariant objects. This approach in it's essence is quite analogous to the well known way to account for relativistic (Lorentz) corrections in powers of γ−1˜(v/c)2«1. The theoretical foundation of our approach is presented by the natural extension of accessible group transformations with the increase of γ from 1 up to infinity; i.e., from Galilei group G10 to the Lorentz – Poincare group P10 and further to the conformal, or Möbius – Weyl – Fock, group C15; clearly, the number of invariants in this process of extension decreases. Nevertheless, we assume the possibility of not only strict, but also of approximate violation of appropriate symmetry as well as the applicability of the perturbation theory in appropriate small parameters γ−1 or 1/γ. It is shown that it is sufficient to restrict oneself with quite special – i.e., one-parameter – variant of conformal group transformations; it occurs that the GZK-limit may be overcome by means of quite natural choice of numerical parameters. References [1] K. Greisen, Phys. Rev. Lett. 16, 748-750 (1966). [2] G.T. Zatsepin, V.A. Kuzmin, Letters to JETP, 4, 114-116 (1966). [3] V.S. Berezinsky, in Proc. 31 th VCCR, 2010, Moscow, MSU.[4] D.A. Kirzhnitz, V.A. Chechin, Jornal of Nuclear Physics (USSR), 15, 1051-1058 (1972). [5] S.Coleman, S.L. Glashow, Phys. Rev. D. 59, 116008 (1999). [6] L.Gonzalez –Mestres, in Proc. 26th ICRC, 1999, arXiv: physics/0003080v1. [7] S.T. Scully., F.W. Stecker, arXiv: astro-ph/0811.2230v4. [8] T. Jacobson, S. Liberati, D. Mattingly, arXiv: hep-ph/0407370v1.

Summary

Primary author(s) : Prof. RUDOY, Yuri (PFUR)

Co-author(s) : Mrs. VERNIGORA, Irina (PFUR)

Presenter(s) : Prof. RUDOY, Yuri (PFUR)

Comments:

Dear colleagues from Organizing Commitee of ISVHECRI 2014!
I and my co-author send you our abstract for poster session and we hope that it will be accepted and later published in the Proceedings of the Symposium; of course, we would like to obtain the one hard copy of it. Unfortunately, nobody of us will have a possibility to arrive at Geneva during the Symposium. So the question is: is the fee for such a distant participation the same - namely, 170 CHF - or it may be somehow lowered?
Thank you in advance for your kind reply, sincerely -
Yu. G. Rudoy.

Status: SUBMITTED

Submitted by on **Saturday 17 May 2014**

Abstract ID : **59**

New eyes for Horizontal Neutrino Astronomy

Abstract content

The horizontal and upward airshower windows may soon become the best sky for neutrino Astronomy. Indeed few tens TeV muons crossing in ICECUBE may offer the best trace of extraterrestrial neutrino in wider ICECUBE volumes,as well as horizontal tau airshowers originted by PeVs tau escaping mountains or Earth in flight and in decay in air. Such horizontal upward events maybe studied better by peculiar geometrical array phototubes whose fine tuned optics may lead to wider and optimal tens TeV-PeVs neutrino detections.

Summary

A novel geometrical array is suggested to reveal crossing muons in ICECUBE, ANTARES or NEMO as well as to detect horizontal tau airshowers skimming the Earth or escaping from deep valleys.

Primary author(s) : Prof. FARGION, Daniele (Rome University 1 Sapienza and INFN)

Presenter(s) : Prof. FARGION, Daniele (Rome University 1 Sapienza and INFN)

Status: SUBMITTED

Submitted by **Prof. FARGION, Daniele** on **Saturday 17 May 2014**

Abstract ID : **6**

VHE gamma-ray emission of Active Galactic Nuclei at red shift from z=0.0179 to z=1.375 by SHALON

Abstract content

The radio-loud active galactic nuclei having the radio emission arising from a core region rather than from lobes are often referred to as "blazars" and include Flat Spectrum Radio Quasars (FSRQ) and BL Lacertae (BL Lac) objects. We present results of long term observations of FSRQ: among them are known object 3c454.3, high-red shifted quasar 1739+522 (4c+51.37) (z=1.375) and 4c+31.63 (z=0.295), 4c+55.17 (z=0.896) as well as BL Lac type object OJ 287 (z=0.306) which was recently detected by SHALON Cherenkov telescopic system. The observation results are presented with integral spectra, images and spectral energy distributions for each of sources at energies above 800 GeV. A number of variability periods in different wavelengths including VHE gamma rays were found. These observations are carrying out with SHALON mirror telescopes at the Tien-Shan high mountainous Observatory of P.N. Lebedev Physical Institute.

Summary

Primary author(s) : SINITSYNA, Vera Yurievna (P)

Co-author(s) : SINITSYNA, Vera Georgievna (P); BORISOV, Sergey (P.N. Lebedev Physical Institute)

Presenter(s) : SINITSYNA, Vera Yurievna (P)

Comments:
Poster

Status: SUBMITTED

Submitted by **SINITSYNA, Vera Yurievna** on **Wednesday 16 April 2014**

Abstract ID : **60**

Monte-Carlo simulation of the TUS space detector for the Ultra High Energy Cosmic Rays study

Abstract content

TUS is the first space detector for the study of the spectrum, composition and anisotropy of the Ultra High Energy Cosmic Rays (UHECR) at the energy higher than 10ˆ19.5 eV. Fluorescent photons of the EAS will be measured. A principal possibility of such EAS study from the space orbit has to be confirmed. TUS data may hopefully overcome some of the contradictions between an existent UHECR data of the ground based detectors. Due to rare UHECR flux and the large Earth background flux fluctuation, the TUS simulation is needed for optimization as technical detector parameters as the on-line trigger program. Dedicated TUSSIM program of the TUS simulation is developed, which takes into account TUS geometrical and optical parameters, FE, DAQ and trigger electronics, and the on-line trigger program algorithm. As a result of Monte-Carlo simulation, the UHECR spectrum was evaluated for 3-5 years of data taking in the 10ˆ19.5 – 10ˆ20.5 eV energy range for the solar synchronized orbit at 500 km altitude and the variable Earth background radiation

Summary

Primary author(s) : Dr. TKACHEV, Leonid (JINR Dubna)

Co-author(s) : Mr. GRINYUK, Ahdrei (JINR. Dubna); Mr. TKACHENKO, Artur (JINR, Dubna)

Presenter(s) : Dr. TKACHEV, Leonid (JINR Dubna)

Comments:
Oral presentation

Status: SUBMITTED

Submitted by **TKACHEV, Leonid** on **Wednesday 21 May 2014**

Abstract ID : **61**

Cosmic rays from AGN

Abstract content

The physical metric in general relativity is introduced as the metric in which speed of light is well defined for the whole space time continuum. The outcome from the time delay experiments is in line with what was predicted by the geodesic equation for this metric. The most important property of the metric is that the gravity inside the horizon is repulsive. The author shows that this property is a natural ingredient for the generation of high energy cosmic rays from AGN (Active Galactic Nuclei), as was suggested by the data from the Pierre Auger Observatory.

Summary

It will be shown that the correlation between high energy cosmic rays and AGN (massive black holes), which has been suggested from the Pierre Auger Observatory, is a natural consequence of the physical metric in general relativity.

Primary author(s) : Prof. TOMOZAWA, Yukio (University of Michigan)

Presenter(s) : Prof. TOMOZAWA, Yukio (University of Michigan)

Comments:
This is an article by a single author. There is no co-author.

Status: SUBMITTED

Submitted by **TOMOZAWA, Yukio** on **Friday 23 May 2014**

Abstract ID : **66**

Propagation of ultra-high energy cosmic rays in a cosmic background of sterile neutrinos in the framework of a left-right symmetric model

Abstract content

Recent measurements of the cosmic background radiation performed by the Planck satellite have exposed some discrepancies between the observations of the low- and high-redshift Universe, which could be alleviated in the context of the Lambda-CDM model if it is assumed the existence of a cosmic background of sterile neutrinos. The existence of sterile neutrinos has been also suggested by some anomalies that have been found in several neutrino oscillation experiments involving accelerators, reactors and radioactive sources. According to the Standard Model of particle physics, sterile neutrinos do not interact with matter via the electroweak and strong forces, but only by gravity. However, in some extensions of the Standard Model, such as the left-right symmetric models, sterile neutrinos could have in addition some feeble interactions with matter mediated by new force-carrier particles. In this contribution, we assume the presence of a relic background of sterile neutrinos in the Universe and study the influence of this medium in the propagation of ultra high-energy cosmic rays by considering the existence of a new interaction mediated by right-handed charged gauge bosons, W_R, in the framework of a left-right symmetric model.

Summary

Primary author(s) : ARTEAGA-VELAZQUEZ, Juan Carlos (Universidad Michoacana)

Co-author(s) : Mr. MARTINEZ, Angelo (Facultad de Ciencias Físico-Matemáticas, Universidad Michoacana)

Presenter(s) : ARTEAGA-VELAZQUEZ, Juan Carlos (Universidad Michoacana)

Status: SUBMITTED

Submitted by **ARTEAGA-VELAZQUEZ, Juan Carlos** on **Friday 30 May 2014**

Abstract ID : **7**

EAS neutron and hadron lateral distributions at different altitudes

Abstract content

An analysis of published experimental data from PRISMA-32 and PRISMA-YBJ arrays is presented. An essential quantity that must be deduced from data is the Lateral Distribution Function (LDF) of Extensive Air Shower (EAS) particles. Measured lateral distribution functions of thermal neutrons and their parent hadrons obtained with the PRISMA-32 array in Moscow (˜200 m a. s. l.) and PRISMA-YBJ array in Tibet (˜4300 m a. s. l.) are analyzed and compared with simulations made with CORSIKA codes.

Summary

Primary author(s) : SHCHEGOLEV, Oleg (I)

Co-author(s) : MA, Xinhua (Institute of High Energy Physics (IHEP)); ZHAO, Jingzhou (Chinese Academy of Sciences (CN)); Mr. ALEKSEENKO, Victor (Institute for Nuclear Research, Russia, Baksan); Mr. STENKIN, Yuri (Institute for Nuclear Research, Russia, Moscow); Mr. STEPANOV, Vladimir (Institute for Nuclear Research, Russia, Moscow); Mr. GROMUSHKIN, Dmitry (National Research Nuclear University «MEPhI», Russia, Moscow); Mr. SULAKOV, Vladimir (Moscow State University, Russia, Moscow)

Presenter(s) : SHCHEGOLEV, Oleg (I)

Status: SUBMITTED

Submitted by **SHCHEGOLEV, Oleg** on **Wednesday 23 April 2014**

Abstract ID : **96**

Proposal of a hybrid experiment on systematic search and study of exotic phenomena, observed in EAS cores, within the framework of the 'Pamir-XXI' project.

Abstract content

We propose a nuclear physics experiment in cosmic rays at a high mountain altitude to study the "fine" structure of cores of extensive air showers (EAS) initiated by primary particles of superhigh energy cosmic rays in order to systematically search for and study unusual events of various types (linearly-aligned gamma-hadron families, hadrons weakly absorbed in lead absorbers, 'Centauro'-type events with an abnormal ratio of charged and neutral particles, 'Chiron'-type events characterizing by a presence of hadron-containing electromagnetic clusters and possessing large transverse momenta, phenomenon of abnormally high proportion of events with high energy density, events with a ring-like structure, etc.), whose appearance in the forward kinematic region at very high energies (E_0 > 1 PeV) may indicate the existence of "new physics" beyond the Standard Model. Such abnormal events were observed previously in high-mountain or balloon-borne cosmic-ray experiments using mainly X-ray emulsion chambers (XREC) which allow experimentalist to distinguish individual high-energy particles in EAS cores due to their high spatial resolution. The specific feature of the proposed experiment is the use of a hybrid setup (HS) for detecting cosmic-ray particles, which will combine the benefits of a passive solid-state XREC detector and active electronic coordinate scintillation calorimeter (CSC). The proposed design of the research facility is a two-storied XREC with a large 2.5-m air gap which is supplemented with a burst detector consisting of several paired solid rows of scintillation counters. In the adjacent rows, the counters will be arranged in a cross-way manner, which will make it possible to study the structure of EAS cores with a spatial accuracy of ˜12 cm and to evaluate the energy of the primary particle with an accuracy of ˜ 30-50%. Newly designed original plastic scintillation counters with fiber optic signal readout and its subsequent conversion into an electrical impulse using pin-photodiodes will be used for this purpose. Exposition of the experimental setup at the Pamirs will be implemented in the framework of the 'Pamir-Chacaltaya' International Scientific Research Center (ISRC-PCh).

Summary

Primary author(s) : Dr. BORISOV, Alexander (LPI RAS)

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Fundamentals of Cherenkov technique for "Pamir-XXI" Detector Array

Abstract content

Main principles of a method for EAS primary parameter determination by air Cherenkov light (CL) are presented to be used by "Pamir-XXI" complex detector array (4250 m a.s.l., Eastern Pamirs). Here we describe the performance of a net of fast optical detectors and a wide-angle Cherenkov telescope which are capable to solve the most delicate problem of the primary particle mass estimation. Core location and shower direction are assessed by the net amplitude/timing data, CL angular distribution (image) algorithm can separate different groups of primary nuclei and also can help to select primary gamma-quanta. Models of shower CL front and lateral distribution needed for direction and core location determination are also presented. Algorithm for primary energy determination will be reported later.

Summary

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