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On the Anisotropy of Cosmic Rays in the Energy Region $E_0 \geq 5.5 \times 10^{19}$ eV according to Data of the PIERRE AUGER Collaboration

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The Pierre Auger Collaboration discovered, in a solid angle of radius about 18° , a local group of cosmic rays having energies in the region $E_0 \geq 5.5 \times 10^{19}$ eV and coming from the region of the Gen A radio galaxy, whose galactic coordinates are $l_G = 309.5^\circ$ and $b_G = 19.4^\circ$. Near it, there is the Centaur supercluster of galaxies, its galactic coordinates being $l_G = 302.4^\circ$ and $b_G = 21.6^\circ$. It is noteworthy that the Large Attractor, which may have a direct bearing on the observed picture, is also there.

Description of Spin–Flavor Neutrino Oscillations within Relativistic Quantum Mechanics

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Spin–flavor oscillations of Dirac neutrinos in matter and in a magnetic field are considered within relativistic quantum mechanics. An effective Hamiltonian that describes spin–flavor neutrino oscillations is derived on the basis of an exact solution of the wave equation written for a massive neutrino with allowance for external fields. It is shown that this approach is equivalent to a standard quantum-mechanical treatment of neutrino oscillations. In addition, the resulting correction to the effective Hamiltonian leads to the emergence of a new resonance in neutrino oscillations. The application of the results obtained in this way to describing neutrino oscillations in an expanding envelope upon the explosion of a supernova is considered. Transitions between right-handed electron neutrinos and hypothetical sterile neutrinos in matter and in the magnetic field of the envelope are studied among other things. The contributions of various factors, including the longitudinal magnetic field, the polarization of matter, and new interactions, to the effective Hamiltonian are also analyzed.

Special Features of Deuteron Production in $^{16}\text{O}p$ Collisions at a Momentum of 3.25 GeV/ c per Nucleon

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New experimental data on the dependences of the mean multiplicities and kinematical features of deuterons produced in $^{16}\text{O}p$ collisions at a momentum of 3.25 GeV/ c on the degree of excitation of the fragmenting nucleus are presented. These experimental data are compared with the predictions of the cascade–fragmentation–evaporation model.

Width of the ϕ Meson in Nuclear Matter

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The ratios of the cross sections for ϕ -meson production induced by 2.83-GeV protons in copper, silver, and gold nuclei to the respective cross section for carbon nuclei were measured at the ANKE-COSY facility in the momentum range 0.6–1.6 GeV/ c and the angular range 0° – 8° . The product ϕ mesons were identified by their decay $\phi \rightarrow K^+ K^-$. The procedure used to separate kaon pairs was described in detail, and all sources of the background and their contribution to the resulting error in the values found for the above cross-section ratios were analyzed. The A dependence of the cross section for ϕ -meson production was shown to obey the $A^{0.56 \pm 0.03}$ law. The total width of the ϕ meson at a normal nuclear density was extracted from a comparison of the measured cross-section ratios with the results of calculations based on two theoretical models. The resulting width value exceeds substantially both the vacuum width and the width expected in the absence of the nuclear-matter effect on the properties of the ϕ meson.