Selected Abstracts from Other Physical Review Journals

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Do the SuperKamiokande atmospheric neutrino results explain electric charge quantization? R. Foot and R. R. Volkas, *School of Physics, Research Centre for High Energy Physics, The University of Melbourne, Parkville 3052 Australia.* (Received 30 September 1998; published 9 April 1999)

We show that the SuperKamiokande atmospheric neutrino results explain electric charge quantization, provided that the oscillation mode is $\nu_\mu \rightarrow \nu_\tau$ and that the neutrino mass is of the Majorana type. [S0556-2821(99)00511-1] [Phys. Rev. D **59**, 097301 (1999)]

Bound on the neutrino magnetic moment from chirality flip in supernovae. Alejandro Ayala and Juan Carlos D'Olivo, *Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México, Apartado Postal 70-543, México Distrito Federal 04510, Mexico;* Manuel Torres, *Instituto de Física, Universidad Nacional Autónoma de México, Apartado Postal 20-364, México Distrito Federal 01000, Mexico.* (Received 4 November 1998; published 10 May 1999)

For neutrinos with a magnetic moment, we show that the collisions in a hot and dense plasma act as an efficient mechanism for the conversion of ν_L into ν_R. The production rate for right-handed neutrinos is computed in terms of a resummed photon propagator which consistently incorporates the background effects. Assuming that the entire energy in a supernova collapse is not carried away by the ν_R, our results can be used to place an upper limit on the neutrino magnetic moment $\mu_\nu < (0.1\text{–}0.4) \times 10^{-11} \mu_B$. [S0556-2821(99)50111-2] [Phys. Rev. D **59**, 111901 (1999)]

Boxing with neutrino oscillations. D. J. Wagner, *Department of Physics and Astronomy, Vanderbilt University, Box 1807 B, Nashville, Tennessee 37235 and Department of Physics, Rensselaer Polytechnic Institute, Troy, New York 12180;* Thomas J. Weiler, *Department of Physics and Astronomy, Vanderbilt University, Box 1807 B, Nashville, Tennessee 37235.* (Received 16 January 1998; published 30 April 1999)

We develop a characterization of neutrino oscillations based on the coefficients of the oscillating terms. These coefficients are individually observable; although they are quartic in the elements of the unitary mixing matrix, they are independent of the conventions chosen for the angle and phase parametrization of the mixing matrix. We call these reparametrization-invariant observables ''boxes'' because of their geometric relation to the mixing matrix, and because of their association with the Feynman box diagram that describes oscillations in field theory. The real parts of the boxes are the coefficients for the *CP*- or *T*-even oscillation modes, while the imaginary parts are the coefficients for the *CP*- or *T*-odd oscillation modes. Oscillation probabilities are linear in the boxes, so measurements can straightforwardly determine values for the boxes (which can then be manipulated to yield magnitudes of mixing matrix elements). We examine the effects of unitarity on the boxes and discuss the reduction of the number of boxes to a minimum basis set. For the three-generation case, we explicitly construct the basis. Using the box algebra, we show that *CP* violation may be inferred from measurements of neutrino flavor mixing even when the oscillatory factors have averaged. The framework presented here will facilitate general analyses of neutrino oscillations among $n \geqslant 3$ flavors. [S0556-2821(99)03009-X] [Phys. Rev. D **59**, 113007 (1999)]

Limits on Majorana neutrinos from recent experimental data. O. L. G. Peres, *Instituto de Física Corpuscular – C.S.I.C., Departamento de Física Teòrica, Universitat of València, 46100 Burjassot, València, Spain;* L. P. Freitas and R. Zukanovich Funchal, *Instituto de Física, Universidade de São Paulo, Caixa Postal 66318, 05315-970 São Paulo, Brazil.* (Received 30 November 1998; published 11 May 1999)

We investigate the sensitivity of some weak processes to the simplest extension of the standard model with Majorana neutrinos mixing in the leptonic sector. Values for mixing angles and masses compatible with several experimental accelerator data and the most recent neutrinoless double-β decay limit were found. [S0556-2821(99)01111-X] [Phys. Rev. D **59**, 113014 (1999)]

Color mutation model of soft interaction in high energy hadronic collisions. Zhen Cao and Rudolph C. Hwa, *Institute of Theoretical Science and Department of Physics, University of Oregon, Eugene, Oregon 97403-5203.* (Received 14 September 1998; published 11 May 1999)

A comprehensive model, called ECOMB (eikonal color mutation branching), is proposed to describe multiparticle production by soft interaction. It incorporates the eikonal formalism, parton model, color mutation, branching, and recombination. The physics is conceptually opposite to the dynamics that underlies the fragmentation of a string. The partons are present initially in an hadronic collision; they form a single, large, color-neutral cluster until color mutation of the quarks leads to a fission of the cluster into two color-neutral subclusters. The mutation and branching processes continue until only $q\bar{q}$ pairs are left in each small cluster. The model contains self-similar dynamics and exhibits scaling behavior in the factorial moments. It can satisfactorily reproduce the intermittency data that

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no other model has been able to fit.
[S0556-2821(99)03611-5] [Phys. Rev. D **59**, 114023 (1999)]

Hard exclusive electroproduction of pseudoscalar mesons and the QCD axial anomaly. Michael I. Eides, *Department of Physics, Pennsylvania State University, University Park, Pennsylvania 16802 and Petersburg Nuclear Physics Institute, Gatchina, St. Petersburg 188350, Russia;* Leonid L. Frankfurt, *School of Physics and Astronomy, Raymond and Beverly Sackler Faculty of Exact Sciences, Tel Aviv University, Ramat Aviv 69978, Israel;* Mark I. Strikman, *Department of Physics, Pennsylvania State University, University Park, Pennsylvania 16802 and Deutsches Elektronen Synchrotron DESY, Hamburg, Germany.* (Received 3 December 1998; published 11 May 1999)

Hard exclusive electroproduction of π^0, η, η' mesons by longitudinal photons is considered. With the help of the QCD factorization theorem we show that at sufficiently large virtualities Q^2 amplitudes of hard exclusive processes may be calculated in terms of the target parton distributions and the minimal Fock component of the pseudoscalar meson light cone wave function at zero interquark distances. This result justifies our calculation of the ratios of the $\pi^0:\eta:\eta'$ yields for the electroproduction processes off nucleons and deuterons based on the low energy QCD chiral dynamics, and the QCD anomaly. [S0556-2821(99)05511-3] [Phys. Rev. D **59**, 114025 (1999)]

Measuring the ν_μ to $\bar{\nu}_\mu$ ratio in a high statistics atmospheric neutrino experiment. J. M. LoSecco, *University of Notre Dame, Notre Dame, Indiana 46556.* (Received 5 June 1998; published 3 May 1999)

By exploiting differences in muon lifetimes it is possible to distinguish ν_μ from $\bar{\nu}_\mu$ charged current interactions in underground neutrino detectors. Such observations would be a useful tool in understanding the source of the atmospheric neutrino anomaly. [S0556-2821(99)06111-1] [Phys. Rev. D **59**, 117302 (1999)]

Larger domains from resonant decay of disoriented chiral condensates. David I. Kaiser, *Lyman Laboratory of Physics, Harvard University, Cambridge, Massachusetts 02138.* (Received 17 November 1998; revised manuscript received 27 January 1999; published 5 May 1999)

The decay of disoriented chiral condensates into soft pions is considered within the context of a linear sigma model. Unlike earlier analytic studies, which focused on the production of pions as the sigma field rolled down toward its new equilibrium value, here we focus on the amplification of long-wavelength pion modes due to parametric resonance as the sigma field oscillates around the minimum of its potential. This process can create larger domains of pion fluctuations than the usual spinodal decomposition process, and hence may provide a viable experimental signature for chiral symmetry breaking in relativistic heavy ion collisions; it may also better explain physically the large growth of domains found in several numerical simulations.
[S0556-2821(99)03911-9] [Phys. Rev. D **59**, 117901 (1999)]

Resonant conversions of extremely high energy neutrinos in dark matter halos. R. Horvat, *''Rudjer Bošković'' Institute, P.O. Box 1016, 10001 Zagreb, Croatia.* (Received 2 December 1998; published 18 May 1999)

We study the effect of adiabatically resonant conversion in galactic halos of neutrinos at the highest energies ($\sim 10^{20}$–10^{22} eV), when the ν source is in the center of a galaxy. Using the standard neutrino properties and the standard cosmological scenario for hot dark matter, we find that interesting conversions may take place just for neutrino parameters relevant to the solar and atmospheric neutrino problem. The effect is due to the large enhancement in the ν density in galactic halos and to the form of the effective matter potential both below and above the pole of the Z resonance. [S0556-2821(99)03210-5] [Phys. Rev. D **59**, 123003 (1999)]